

INSECTS OF HAWAII

A Manual of the Insects of the Hawaiian Islands, including an Enumeration of the Species and Notes on their Origin, Distribution, Hosts, Parasites, etc.

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VOLUME 8

LEPIDOPTERA: PYRALOIDEA

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PREFACE TO VOLUME 8

This volume continues the study of the Hawaiian Lepidoptera from Volume 7 of this series, and that volume should be consulted for an introduction to the Lepidoptera, history of Hawaiian lepidopterology and other features which will not be repeated here. The two volumes were written concurrently, and the preface to Volume 7 applies largely to Volume 8, and it may be restated here with slight alteration.

This eighth volume of *Insects of Hawaii* contains information concerning 226 kinds of pyraloid moths known to me to occur in Hawaii when I closed my records at the end of 1956. These insects are contained in 44 genera (compared with 46 genera containing 158 kinds of Macrolepidoptera). Of these totals, 190 of the species are endemic and 36 are foreign; seven of the genera are endemic. Only four subfamilies of Pyraloidea (the Pyraustinae, Scopariinae, Crambinae and Phycitinae) are represented in the endemic fauna. Ninety percent of the 190 endemic species are contained in only five genera.

During the course of this research, it has been discovered that an unusually large percentage of the names of the Hawaiian Pyraloidea, as used in Hawaii, require change, and entomologists in Hawaii will note herein many changes in the names of genera and species which they have long been accustomed to using.

I have now listed about 1,600 kinds of insects in these first eight volumes of *Insects of Hawaii*. Over 4,000 species remain to be included in future volumes. The previously published volumes in this series are: 1—*Introduction* (Geology, Evolution, Distribution, etc.); 2—*Apterygota to Thysanoptera*; 3—*Heteroptera*; 4—*Homoptera: Auchenorrhyncha*; 5—*Homoptera: Sternorrhyncha*; 6—*Ephemeroptera-Neuroptera-Trichoptera and Supplement to Volumes 1 to 5*; 7—*Macrolepidoptera*. There remain to be completed volumes on the Microlepidoptera, Coleoptera, Hymenoptera and Diptera. I am now working on the Microlepidoptera, and I have assembled, over a period of more than 20 years, extensive manuscripts on the Coleoptera and Hymenoptera. Several years ago, I invited D. Elmo Hardy, entomologist, Hawaii Agricultural Experiment Station, University of Hawaii, to undertake the task of preparing the volumes on the Diptera, and two of his volumes are expected to be published soon.

Reference should be made to the "Preface to the First Five Volumes," in Volume 1 of this series, for a detailed outline of the plan and scope of the series, comments and general acknowledgements.

The major purpose of these volumes is to take stock of the known Hawaiian insects and to facilitate their identification. It has never been my intention to describe new species in these books, although I have examined large numbers of new species during the course of the writing. Had I described the new species I

know, few volumes could ever have been completed, and I might yet be working, perhaps, on only the second or third systematic volume of this series.

These volumes have been written to be used with *Fauna Hawaiiensis* and the *Proceedings of the Hawaiian Entomological Society*, and it is assumed that readers will have available those publications.

Work began on this series soon after my return to the Bishop Museum, Honolulu, from the 1934 Mangarevan Expedition to southeastern Polynesia. I was then greatly encouraged, stimulated and aided by my faithful mentor, the late C. Montague Cooke, Jr. The task was continued during my years at the Bishop Museum and later at the Experiment Station, Hawaiian Sugar Planters' Association, until I resigned in 1954, following administrative changes which resulted in work on this series being ordered abandoned. During my service with the Experiment Station, C. E. Pemberton was my superior officer, and he always gave me his strongest support and contributed much toward the progress of my work. In 1949, a Fulbright grant, together with further support from the Trustees of the Hawaiian Sugar Planters' Association, enabled me to spend two years at the British Museum (Natural History). The work has been supported by the National Science Foundation since 1954, and the research was continued at the British Museum (Natural History) through 1956.

I am most deeply indebted to the National Science Foundation, Washington, for their generous support and for their broad understanding of the many problems involved in this project. The Foundation's aid rescued Volumes 6, 7 and 8 from loss and has enabled their completion and publication.

From the time of my arrival in Hawaii in 1934, Dr. O. H. Swezey, Experiment Station, Hawaiian Sugar Planters' Association, retired, has been a close friend, teacher, honored associate and a constant contributor to the progress of this series. Much of what I have recorded herein regarding the habits and early stages of the Hawaiian Lepidoptera has come from Dr. Swezey's research. This book would be a mere shadow of itself if it were not for the observations made by Dr. Swezey over a period of nearly 50 years. No other person or combination of persons has contributed so much to our knowledge of the biologies of the Lepidoptera of Hawaii as has Dr. Swezey. My debt to him is great, and these books are in large part a tribute to him. Additional comment about Dr. Swezey is in the section on the history of Hawaiian lepidopterology, page 28 of Volume 7.

This volume could never have been completed without the cooperation of the Trustees, Director Sir Gavin de Beer, and the able staff of the British Museum (Natural History). To them I am most deeply indebted. In my field of research, the collections and libraries of the Natural History Museum are the most complete and best organized of any in the world. It is there, of course, that the great, historical, incomparable Hawaiian collections of Dr. R. C. L. Perkins are stored.

The California Academy of Sciences, San Francisco, which I have known for more than 30 years, and its Director, Robert C. Miller, have kindly administered the National Science Foundation grant, and E. S. Ross and Hugh B. Leech, officers in charge of entomology at the Academy, have aided me in many ways.

Juliette Wentworth, although retired and now living on the rim of Kilauea

Volcano with her geologist husband, has edited this volume as she has so ably edited the previous seven volumes. Thomas Nickerson, chairman, University of Hawaii Press, and his entire staff deserve the best of thanks for the efficient manner in which they have carried this volume through the processes of publication, and I extend my special thanks to Aldyth V. Morris, managing editor, who has had direct charge of the production of this book.

This text could never have been completed in its present form were it not for the unparalleled assistance received from W. H. T. Tams, D. S. Fletcher and J. D. Bradley. Mr. Tams's knowledge of facts and literature pertaining to the Lepidoptera is prodigious, and his contributions to my work have been voluminous. Mr. Fletcher and Mr. Bradley have been a constant source of assistance from the time I first went to the British Museum (Natural History) to study. Each of them has made numerous dissections for this volume, and they have contributed in many ways to the successful completion of the work. Edward L. Martin, who was formerly specializing on the pyralids at the Natural History Museum, assisted me with many problems. These men, with the exception of Mr. Martin who has now joined the Geology Museum, are members of the staff of the British Museum (Natural History).

Other British Museum staff who have contributed to the production of this volume include N. D. Riley, W. E. China, J. P. Doncaster, J. Balfour-Browne, E. B. Britton, J. F. Perkins (son of Dr. R. C. L. Perkins), Miss C. M. F. von Hayek, H. M. Edelsten, B. J. Clifton, A. C. Townsend, C. W. F. Claxton, Miss B. Eborall, S. F. Turpin and M. E. Bacchus.

Pierre Viette, Museum National d'Histoire Naturelle, Paris, made a large number of the dissections used for this study, when he assisted me in London, and I appreciate greatly his contribution to the project.

Mrs. D. J. Williams and Mrs. J. P. Doncaster typed the final draft of the manuscript, and their husbands, mentioned here, assisted greatly in proofreading the typescript.

L. D. Tuthill, University of Hawaii, originally recommended the publication of this series to the University of Hawaii Press, and his interest and assistance continue.

At the Experiment Station, Hawaiian Sugar Planters' Association, my former associates, now retired, C. E. Pemberton, F. X. Williams and R. H. Van Zwahlenburg, contributed much to this work over the years. Dr. Pemberton remains a constant contributor of assistance of many kinds. F. A. Bianchi, and J. W. Beardsley have supplied much information, loaned specimens for study and obtained a number of illustrations.

In 1941, I worked on preliminary manuscript at the U. S. National Museum. From that time until the present, J. F. Gates Clarke, now Curator of Insects, has assisted me in ways too numerous to list, and he has been a staunch supporter of this series.

Other workers who have played an active part in this work include:

Sir Guy A. K. Marshall, W. J. Hall, E. O. Pearson, Fritz van Emden, R. D.

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Ernst Mayr, P. J. Darlington and W. L. Brown, Jr., Museum of Comparative Zoology, Harvard University. I spent much time using the excellent library and facilities at Harvard in 1941, 1956-58.

Harold J. Coolidge, Pacific Science Board, National Research Council, Washington.

E. O. Essig, E. G. Linsley, R. L. Usinger and W. Harry Lange, Jr., University of California.

E. H. Bryan, Jr., and J. L. Gressitt, Bishop Museum, Honolulu.

It is now my most pleasant duty to express my deep appreciation to the artists and photographers whose excellent work forms a major contribution to this volume. Illustrations "speak an international language," and I let them convey to my readers information which could not be told as well with tens of thousands of words.

Miss Hazel Rough made most of the drawings of the wings, but, sadly, died before she completed the series. J. D. Bradley checked the drawings with the slides, and he finished some that Miss Rough did not complete.

Arthur Smith, British Museum (Natural History) made the drawings of the heads, some of the drawings of wings, and the diagrams of morphological features.

J. T. Yamamoto, Experiment Station, Hawaiian Sugar Planters' Association, photographed the types which are stored in Honolulu and many of the specimens which are not types.

R. C. Pittman, Wallace Heaton, Ltd., (London) photographed many of the types in the British Museum (Natural History).

M. G. Sawyers and C. A. Horton, expert staff photographers, British Museum (Natural History) made many photographs of moths and dissections.

Harold Malies, expert photomicrographer, formerly doing his work at the British Museum (Natural History), made most of the photographs of the hundreds of dissections, and his contribution is singularly outstanding.

To the staff of the Advertiser Publishing Co., Ltd., Honolulu, I owe thanks for the expert workmanship used in the production of this volume and for the promptness with which it has been manufactured.

E.C.Z.

British Museum (Natural History)

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INSECTS OF HAWAII

CHECKLIST OF THE INSECTS IN THIS VOLUME

Order **LEPIDOPTERA**, continued

Suborder DITRYZIA, continued

Series HETEROCERA, continued

Superfamily PYRALOIDEA

Family PYRALIDAE

Subfamily GALLERIINAE

Genus **GALLERIA** Fabricius

 **mellonella** (Linnaeus)

Genus **ACHROIA** Huebner

grisella (Fabricius)

Genus **APHOMIA** Huebner

gularis (Zeller)

Genus **CORCYRA** Ragonot

cephalonica (Stainton)

Subfamily PYRAUSTINAE

Genus **HELLULA** Guenée

undalis (Fabricius)

Genus **LINEODES** Guenée

ochrea Walsingham

Genus **HYPERECTIS** Meyrick

diectias Meyrick

Genus **TERASTIA** Guenée

meticulosalis Guenée

Genus **OMPHISA** Moore

anastomosalis (Guenée)

Genus **NOMOPHILA** Huebner

noctuella (Denis and Schiffermueller)

Genus **HYMENIA** Huebner
recurvalis (Fabricius)

Genus **MARUCA** Walker
testulalis (Geyer)

Genus **MARGARONIA** Huebner
cyanomichla Meyrick
exaula (Meyrick)

Genus **HEDYLEPTA** Lederer
accepta (Butler)
anastrepta (Meyrick)
anastreptoides (Swezey)
antidoxa (Meyrick)
asaphombra (Meyrick)
blackburni (Butler)
continuatalis (Wallengren)
demaratalis (Walker)
epicentra (Meyrick)
euryprora (Meyrick)
fullawayi (Swezey)
giffardi (Swezey)
iridias (Meyrick)
laysanensis (Swezey)
localis (Butler)
maia (Swezey)
meyricki (Swezey)
monogona (Meyrick)
monogramma (Meyrick)
musicola (Swezey)
pritchardii (Swezey)
scotaea (Hampson)
telegrapha (Meyrick)

Genus **URESIPHITA** Huebner
polygonalis (Denis and Schiffermueller)

Genus **OEOBIA** Huebner
argoscelis (Meyrick)
aurora (Butler)
brontias (Meyrick)
bryochloris (Meyrick)
calliastra calliastra (Meyrick)
calliastra hyacinthias (Meyrick)
calliastra synastra (Meyrick)
caminopis (Meyrick)

cataphaea (Meyrick)
chalcophanes (Meyrick)
chloropis (Meyrick)
chytropa (Meyrick)
conisalias (Meyrick)
constricta (Butler)
despecta (Butler)
dracontias (Meyrick)
dryadopa (Meyrick)
endopyra (Meyrick)
ennychioides (Butler)
ephippias (Meyrick)
eucrena (Meyrick)
helioxantha (Meyrick)
heterodoxa (Meyrick)
lampadias (Meyrick)
liopis liopis (Meyrick)
liopis rhodias (Meyrick)
litorea (Butler)
melanopis (Meyrick)
metasema (Meyrick)
micacea (Butler)
monticolans (Butler)
nigrescens (Butler)
ommatias (Meyrick)
pachygramma (Meyrick)
phaethontia (Meyrick)
phyllostegia (Swezey)
platyleuca (Meyrick)
psychropa (Meyrick)
pyranthes (Meyrick)
stellata (Butler)
swezeyi (Zimmerman)
thermantis (Meyrick)
thermantoides (Swezey)
violae (Swezey)

Subfamily SCOPARIINAE

Genus **SCOPARIA** Haworth

actias Meyrick
aeolias Meyrick
amphicypella Meyrick
antimacha Meyrick

balanopis Meyrick
bucolica bucolica Meyrick
bucolica macrophanes (Meyrick)
bucolica pyrseutis (Meyrick)
clonodes Meyrick
crataea Meyrick
cryerodes Meyrick
dactyliopa Meyrick
demodes (Meyrick)
empeda Meyrick
epimystis Meyrick
erebochalca Meyrick
formosa (Butler)
frigida Butler
geraea Meyrick
gonodecta Meyrick
halirrhoa Meyrick
hawaiiensis Butler
ianthes Meyrick
ischnias (Meyrick)
isophaea Meyrick
jucunda Butler
loxocentra Meyrick
lycopodiae Swezey
marmarias Meyrick
melanocephala Meyrick
melichlora Meyrick
meristis halmaea (Meyrick)
meristis meristis Meyrick
mesoleuca (Meyrick)
miantis Meyrick
montana (Butler)
nectarioides Swezey
nyctombra Meyrick
oenopis Meyrick
ombrodes ombrodes (Meyrick)
ombrodes perkinsi Zimmerman
orthoria Meyrick
oxythyma Meyrick
pachysema (Meyrick)
parachlora Meyrick
passalota Meyrick
pentaspila Meyrick
peronetis Meyrick

platyscia Meyrick
probolaea Meyrick
religiosa Meyrick
rhombias Meyrick
siderina Meyrick
struthias Meyrick
tetranesa Meyrick
thalamias Meyrick
thyellopis Meyrick
triacma Meyrick
tyraula Meyrick
venosa Butler
zophochlora Meyrick

Subfamily NYMPHULINAE

Genus **PARAPONYX** (Huebner) Guenée
fluctuosalis (Zeller)

Genus **SYNCLITA** Lederer
obliteralis (Walker)

Subfamily PYRALINAE

Genus **PYRALIS** Denis and Schiffermueller
manihotalis Guenée

Genus **HYPSOPYGIA** Huebner
mauritialis (Boisduval)

Subfamily CRAMBINAE

Genus **ORTHOMECYNA** Butler
albicaudata Butler
alloptila Meyrick
amphilyca Meyrick
aphanopis Meyrick
chrysophanes Meyrick
crossias Meyrick
epicausta Meyrick
exigua exigua (Butler)
exigua cupreipennis Butler
heterodryas Meyrick
mesochasma Meyrick

metalycia Meyrick
phaeophanes Meyrick
picrodes Meyrick

Genus **MESTOLOBES** Butler

abnormis (Butler)
amethystias Meyrick
antichora Meyrick
aphrias Meyrick
arctura Meyrick
autodoxa Meyrick
banausa Meyrick
chimonias Meyrick
chlorolychna Meyrick
chrysomolybda Meyrick
chrysomolybdoides Swezey
droseropa Meyrick
epidelta Meyrick
erinnys Meyrick
eurylyca Meyrick
homalopa Meyrick
iochrysa Meyrick
mesacma Meyrick
minuscula (Butler)
ochrias Meyrick
ombrias Meyrick
orthrias Meyrick
perixantha Meyrick
pessias Meyrick
pragmatica Meyrick
quadrifasciata Swezey
scleropis Meyrick
semiochrea Butler
sicaria Meyrick
sirina Meyrick
xanthoscia Meyrick

Genus **MESTOLOBES** subgenus **PROMYLAEA** (Meyrick)

pyropa (Meyrick)
quadrifascia (Swezey)

Genus **TULLA** Zimmerman
exonoma (Meyrick)

Genus **EUCHROMIUS** Guenée
ocelleus (Haworth)

Genus **CHILO** Zincken
suppressalis (Walker)

Genus **TAMSICA** Zimmerman
floricolans (Butler)
geralea (Meyrick)
homodora (Meyrick)
hyacinthina (Meyrick)
hydrophila (Butler)
oxyptera (Meyrick)

Subfamily PHYCITINAE

Genus **CACTOBLASTIS** Ragonot
cactorum (Berg)

Genus **ECTOMYELOIS** Heinrich
ceratoniae (Zeller)

Genus **CRYPTOBLABES** Zeller
aliena Swezey

Genus **GENOPHANTIS** Meyrick
iodora Meyrick
leahi Swezey

Genus **HOMOEOSOMA** Curtis
albosparsum (Butler)

Genus **UNADILLA** Hulst
bidensana (Swezey)
humeralis (Butler)

Genus **RHYNCHEPHESTIA** Hampson
rhabdotis Hampson

Genus **EPHESTIODES** Ragonot
gilvescentella Ragonot

Genus **EPHESTIA** Guenée
cautella (Walker)
elutella (Huebner)
figulilella Gregson

Genus **ANAGASTA** Heinrich
kühniella (Zeller)

Genus **PLODIA** Guenée
interpunctella (Huebner)

Family PTEROPHORIDAE

- Genus **MEGALORHIPIDA** Amsel
defectalis (Walker)
- Genus **LIOPTILODES** Zimmerman
parvus (Walsingham)
- Genus **LANTANOPHAGA** Zimmerman
pusillidactyla (Walker)
- Genus **ANSTENOPTILIA** Zimmerman
marmorodactyla (Dyar)
- Genus **STENOPTILODES** Zimmerman
littoralis littoralis (Butler)
littoralis rhynchophora (Meyrick)
taprobanes brachymorpha (Meyrick)

Family ALUCITIDAE

- Genus **ORNEODES** Latreille
objurgatella Walsingham

SUMMARY OF THE NOMENCLATORIAL CHANGES MADE IN THIS VOLUME

PYRALIDAE

PYRAUSTINAE

- Lineodes subextincta* Walsingham, 1907, is a new synonym of *Lineodes ochrea* Walsingham, 1907.
- Hydriris exaucta* Meyrick, 1928, is a new synonym of *Hyperectis dioctias* Meyrick, 1904.
- Hymenia exodias* Meyrick, 1904, is a new synonym of *Hymenia recurvalis* (Fabricius).
- Loxocreon* Warren, 1892, is reduced to a new synonym of *Hedylepta* Lederer.
- Omiodes accepta* (Butler, 1877, *Botys*) Meyrick, 1888 is transferred to *Hedylepta*.
- Omiodes anastrepta* Meyrick, 1899, is transferred to *Hedylepta*.
- Omiodes anastreptoides* Swezey, 1913, is transferred to *Hedylepta*.
- Omiodes antidoxa* Meyrick, 1904, is transferred to *Hedylepta*.
- Omiodes asaphombra* Meyrick, 1899, is transferred to *Hedylepta*.
- Omiodes blackburni* (Butler, 1877, *Botys*) Meyrick, 1888, is transferred to *Hedylepta*.

- Omiodes continuatalis* (Wallengren, 1860, *Salbia*) Meyrick, 1888, is transferred to *Hedylepta*.
- Omiodes demaratalis* (Walker, 1859, *Botys*) Meyrick, 1888, is transferred to *Hedylepta*.
- Omiodes epicentra* Meyrick, 1899, is transferred to *Hedylepta*.
- Omiodes euryprora* Meyrick, 1899, is transferred to *Hedylepta*.
- Omiodes fullawayi* Swezey, 1913, is transferred to *Hedylepta*.
- Omiodes giffardi* Swezey, 1921, is transferred to *Hedylepta*.
- Omiodes iridias* Meyrick, 1899, is transferred to *Hedylepta*.
- Omiodes laysanensis* Swezey, 1914, is transferred to *Hedylepta*.
- Omiodes localis* (Butler, 1879, *Botys*) Meyrick, 1888, is transferred to *Hedylepta*.
- Omiodes maia* Swezey, 1909, is transferred to *Hedylepta*.
- Omiodes meyricki* Swezey, 1907, is transferred to *Hedylepta*.
- Omiodes monogona* Meyrick, 1888, is transferred to *Hedylepta*.
- Omiodes monogramma* Meyrick, 1899, is transferred to *Hedylepta*.
- Omiodes musicola* Swezey, 1909, is transferred to *Hedylepta*.
- Omiodes pritchardii* Swezey, 1948, is transferred to *Hedylepta*.
- Omiodes scotaea* (Hampson, 1912, *Nacoleia*) Swezey, 1913, is transferred to *Hedylepta*.
- Omiodes telegrapha* Meyrick, 1899, is transferred to *Hedylepta*.
- Nacoleia hemiombra* Hampson, 1912, is a new synonym of *Hedylepta asaphombra* (Meyrick, 1899).
- Mecyna virescens* Butler, is a new synonym of *Uresiphita polygonalis* (Denis and Schiffermueller).
- Udea* Guenée, 1845, is a new synonym of *Oeobia* Huebner, 1825.
- Protocolletis* Meyrick, 1888, is a new synonym of *Oeobia* Huebner, 1825.
- Protaulacistis* Meyrick, 1899, is a new synonym of *Oeobia* Huebner, 1825.
- Notophytis* Meyrick, 1932, is a new synonym of *Oeobia* Huebner, 1825.
- Phlyctaenia argoscelis* (Meyrick, 1888, *Scopula*) is transferred to *Oeobia*.
- Phlyctaenia calliastra* Meyrick, 1899, is transferred to *Oeobia*.
- Phlyctaenia hyacinthias* Meyrick, 1899, is reduced to a subspecies of *Oeobia calliastra* (Meyrick, 1899).
- Phlyctaenia synastra* Meyrick, 1899, is reduced to a subspecies of *Oeobia calliastra* (Meyrick, 1899).
- Phlyctaenia caminopis* Meyrick, 1899, is transferred to *Oeobia*.
- Phlyctaenia chalcophanes* Meyrick, 1899, is transferred to *Oeobia*.
- Phlyctaenia chytropa* Meyrick, 1899, is transferred to *Oeobia*.
- Phlyctaenia despecta* (Butler, 1877, *Rhodaria*) Meyrick, 1899, is transferred to *Oeobia*.
- Phlyctaenia campylothecae* Swezey, 1946, is a new synonym of *Oeobia despecta* (Butler).
- Phlyctaenia endopyra* Meyrick, 1899, is transferred to *Oeobia*.
- Phlyctaenia ennychioides* (Butler, 1881, *Mecyna*) Meyrick, 1899, is transferred to *Oeobia*.

- Phlyctaenia ephippias* Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia eucrena (Meyrick, 1888, *Scopula*) Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia heterodoxa Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia lampadias Meyrick, 1904, is transferred to *Oeobia*.
Phlyctaenia liopis Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia rhodias Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia metasema Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia micacea (Butler, 1881, *Aporodes* ?) Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia iocrossa Meyrick, 1899, is a new synonym of *Oeobia micacea* (Meyrick).
Phlyctaenia monticolans (Butler, 1882, *Locastra*) Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia nigrescens (Butler, 1881, *Mecyna*) Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia ommatias Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia pachygramma Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia phyllostegia Swezey, 1946, is transferred to *Oeobia*.
Phlyctaenia platyleuca Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia pyranthes Meyrick, 1899, is transferred to *Oeobia*.
Phlyctaenia stellata (Butler, 1883, *Melanomecyna*) is transferred to *Oeobia*.
Phlyctaenia violae Swezey, 1933, is transferred to *Oeobia*.
Mecyna aurora (Butler, 1881, *Anemosa*) Meyrick, 1899, is transferred to *Oeobia*.
Pyrausta brontias Meyrick, 1899, is transferred to *Oeobia*.
Pyrausta chloropis Meyrick, 1899, is transferred to *Oeobia*.
Pyrausta constricta (Butler, 1882, *Scopula*) Meyrick, 1899, is transferred to *Oeobia*.
Pyrausta draconias Meyrick, 1899, is transferred to *Oeobia*.
Pyrausta dryadopa Meyrick, 1899, is transferred to *Oeobia*.
Pyrausta litorea (Butler, 1883, *Scopula*), is transferred to *Oeobia*.
Pyrausta phaethontia Meyrick, 1899, is transferred to *Oeobia*.
Pyrausta psychropa Meyrick, 1899, is transferred to *Oeobia*.
Pyrausta thermantis Meyrick, 1899, is transferred to *Oeobia*.
Pyrausta thermantoidis Swezey, 1913, is emended to *themantoides* and transferred to *Oeobia*.
Notophytis bryochloris (Meyrick, 1899, *Pyrausta*) Meyrick, 1932, is transferred to *Oeobia*.
Protaulacistis cataphaea Meyrick, 1899, is transferred to *Oeobia*.
Protaulacistis swezeyi Zimmerman, 1951, is transferred to *Oeobia*.
Pionea leucozonea Hampson, 1913, is a new synonym of *Oeobia eucrena* (Meyrick).
Pionea poliochroa Hampson, 1913, is a new synonym of *Oeobia litorea* (Butler).
Loxostege conisalias Meyrick, 1899, is transferred to *Oeobia*.
Loxostege helioxantha Meyrick, 1899, is transferred to *Oeobia*.
Loxostege melanopis Meyrick, 1899, is transferred to *Oeobia*.

SCOPARIINAE

- Scoparia macrophanes* Meyrick, 1888, is reduced to a subspecies of *Scoparia bucolica* Meyrick, 1899.
- Scoparia pyrseutis* Meyrick, 1899, is reduced to a subspecies of *Scoparia bucolica* Meyrick, 1899.
- Scoparia nectarias* Meyrick, 1899, is a new synonym of *Scoparia ianthes* Meyrick, 1899.
- Scoparia halmaea* Meyrick, 1899, is reduced to a subspecies of *Scoparia meristis* Meyrick, 1899.
- Scoparia melanopis* (Meyrick, 1888, *Xeroscopa*) Meyrick, 1899, is a new synonym of *Scoparia montana* (Butler, 1882).
- Scoparia gymnopis* Meyrick, 1904, is a new synonym of *Scoparia oenopis* Meyrick, 1899.
- Scoparia catactis* Meyrick, 1904, is a new synonym of *Scoparia ombrodes* (Meyrick, 1888).
- Scoparia ombrodes perkinsi* Zimmerman, new subspecies, for *Scoparia ombrodes* of Meyrick, 1904, not Meyrick, 1888.
- Scoparia omichlopis* Meyrick, 1899, is a new synonym of *Scoparia probolaea* Meyrick, 1899.

CRAMBINAE

- Mestolobes crypsichrysa* Meyrick, 1899, is a new synonym of *Mestolobes chrysomolybda* Meyrick, 1899.
- Promylaea* Meyrick, 1899, is reduced to a subgenus of *Mestolobes* Butler, 1882.
- Promylaea pyropa* Meyrick, 1899, is now *Mestolobes* (*Promylaea*) *pyropa* (Meyrick).
- Promylaea quadrifasciata* Swezey, 1934, is now *Mestolobes* (*Promylaea*) *quadrifasciata* (Swezey).
- Tulla* Zimmerman, new genus.
- Prionoptyx exonoma* Meyrick, 1899, is transferred to *Tulla* Zimmerman, as type.
- Tamsica* Zimmerman, new genus.
- Talis floricolans* (Butler, 1883, *Gesneria*) Meyrick, 1899, is transferred to *Tamsica* Zimmerman, as type.
- Talis geralea* Meyrick, 1899, is transferred to *Tamsica*.
- Talis homodora* Meyrick, 1899, is transferred to *Tamsica*.
- Talis hyacinthia* Meyrick, 1899, is transferred to *Tamsica*.
- Talis hydrophila* (Butler, 1882, *Scotomera*) Meyrick, 1899, is transferred to *Tamsica*.
- Talis oxyptera* (Meyrick, 1888) Meyrick, 1899, is transferred to *Tamsica*.

PHYCITINAE

- Ephestia alboparsum* Butler, 1881, is a good species and is transferred to *Homoiosoma*.

Homoeosoma amphibola Meyrick, 1899, is a new synonym of *Homoeosoma albo-sparsum* (Butler, 1881, *Ephestia*).

Homoeosoma bidensana Swezey, 1933, is transferred to *Unadilla*.

Homoeosoma humeralis (Butler, 1881, *Ephestia*) Meyrick, 1888, is transferred to *Unadilla*.

PTEROPHORIDAE

Lioptilodes Zimmerman, new genus.

Pterophorus parvus (Walsingham, 1880, *Lioptilus* ?) Fernald, 1898, is transferred to *Lioptilodes* Zimmerman, as type.

Lantanophaga Zimmerman, new genus.

Platyptilia pusillidactyla (Walker, 1864, *Oxyptilus*) Fletcher, 1909, is transferred to *Lantanophaga* Zimmerman, as type.

Anstenoptilia Zimmerman, new genus.

Platyptilia marmorodactyla Dyar, 1902, is transferred to *Anstenoptilia* Zimmerman, as type.

Stenoptilodes Zimmerman, new genus.

Platyptilus littoralis Butler, 1882, is transferred to *Stenoptilodes* Zimmerman, as type.

Platyptilia rhynchophora Meyrick, 1888, is transferred to *Stenoptilodes* and reduced to a subspecies of *Stenoptilodes littoralis* (Butler).

Platyptilia inceptrix Meyrick, 1913, is a new synonym of *Stenoptilodes littoralis rhynchophora* (Meyrick).

Platyptilia insularis Walsingham, 1907, is a new synonym of *Stenoptilodes littoralis rhynchophora* (Meyrick).

Platyptilia taprobanes (Felder, 1875, *Amblyptilia*) is transferred to *Stenoptilodes*.

Platyptilia brachymorpha Meyrick, 1888, is transferred to *Stenoptilodes* as a subspecies of *Stenoptilodes taprobanes* (Felder, 1875).

ALUCITIDAE

Orneodes angustestriata Walsingham, 1907, is a new synonym of *Orneodes objurgatella* Walsingham, 1907.

Order **LEPIDOPTERA**, continued

Series **HETEROCERA**, continued

Superfamily **PYRALOIDEA**

Pyralides Leach, 1815:135.

Pyralidina Ragonot, 1890:445.

Pyralidoidea Mosher, 1916:72. Forbes, 1923:521.

Pyraloidea Tillyard, 1926:429. Börner, 1939:1423.

Beirne, 1952. Meyrick, 1890. Shibuya, 1928.

There are two schools of thought on the spelling of the suprageneric categories based upon *Pyralis*. It appears that it is strictly correct to derive the names from *pyralis-idos*, hence *pyralid*, Pyralidinae, Pyralididae and Pyralidoidea, and, certainly, some of the earliest usages were in this form. Recently, however, there has been a growing move to simplify the spellings of this name and names of similar construction, *Pieris* and Pieridae, for example. I have, therefore, decided that the simplified form should be used in this text. The forms Pyralidae and Pieridae are much easier pronounced and spelled than the more cumbersome Pyralididae and Pierididae.

Details of the characters of this diverse group of moths can be obtained from the standard texts, although there is some difference of opinion as what families should be included.

DERIVATION OF THE HAWAIIAN PYRALOIDEA

These studies have resulted in major changes in the taxonomy of the Hawaiian pyralids and the statement in the "Introduction" to this series of volumes (Vol. 1, p. 76) that "chaos exists in the classification of the Lepidoptera" is given strong emphasis. An examination of the list of new combinations (generic transfers) graphically reveals this situation. Under the one genus *Oeobia*, for example, I have assembled 44 species which heretofore have been placed in several different genera, and 18 different generic names have been applied to various of the species at different times, none of which generic names is *Oeobia*. The analysis given in Volume 1, therefore, is mostly quite incorrect. Although an attempt has been made here to elucidate the derivation of the pyralid fauna, little success has been achieved because of the lack of knowledge of the family as a whole in other parts of the world.

In this volume there are listed 226 pyralids, of which 190 are endemic and 36 immigrant or introduced.

TABULAR ANALYSIS OF THE HAWAIIAN PYRALOIDEA

FAMILY OR SUBFAMILY	GENERA	ENDEMIC GENERA	NON-ENDEMIC GENERA	SPECIES	ENDEMIC SPECIES	ADVENTIVE SPECIES
Galleriinae	4	0	4	4	0	4
Pyraustinae	12	0	12	78	69	9
Scopariinae	1	0	1	61	61	0
Nymphulinae	2	0	2	2	0	2
Pyralinae	2	0	2	2	0	2
Crambinae	7	5	2	56	54	2
Phyctinae	11	2	9	15	6	9
Pterophoridae	5	0	5	7	0	7
Alucitidae	1	0	1	1	0	1
Totals	45	7	38	226	190	36

Number of genera containing endemic species: 13.

Number of genera containing adventive species: 32.

Number of genera containing only endemic species: 13.

Number of genera containing only adventive species: 32.

Number of genera containing both endemic and adventive species: 0.

Percentage of endemism in native group: genera, 53.9 percent; species: 100 percent.

Percentage of present-day fauna endemic: 84.

Percentage of present-day fauna adventive: 15.

Average number of species per genus in endemic group: 14.6.

Average number of species per genus in adventive group: 1.12.

For simplification, I have included subgenera and subspecies in the totals of genera and species. The figures in this and similar tables in this work may be explained as follows:

1. "Percentage of endemism in native group: genera" means the percentage obtained by dividing the number of endemic genera by the total number of genera containing native (endemic and indigenous) species. (In this case, 53.9 percent of the genera which contain endemic species are themselves endemic.)

2. "Percentage of endemism in native group: species" means the percentage obtained by dividing the number of endemic species by the total number of endemic plus indigenous species.

3. "Percentage of present-day fauna native" is obtained by dividing the total number of endemic plus indigenous species by the total number of species recorded from the islands (endemic + indigenous + adventive).

4. "Percentage of present-day fauna adventive" is, similarly, the total number of species divided into the total of adventive species.

5. The average number of species per genus is obtained simply by dividing the total number of species in the native or adventive group by the total number of genera containing those species.

The 36 foreign species have gained entrance to Hawaii through the agencies of man, and they are included in 32 genera. Of these 36 species, 17 (with 2 uncertainties) are considered to have entered Hawaii from the Pacific, and 19 (with 2 uncertainties) have come from America.

The 12 genera which include endemic species may represent 11 to 13 ancestral invasions. The uncertainty as to the origin of *Orthomecyna*, *Mestolobes*, *Tulla* and *Tamsica* adds confusion to the situation. A tentative tabulation follows.

TABULAR SUMMARY OF THE ENDEMIC HAWAIIAN PYRALIDAE

SUBFAMILY	GENUS	NUMBER OF SPECIES	ANCESTRAL SOURCE		
			Pacific	Boreal	Unknown
Pyraustinae	<i>Margaronia</i>	2	2 invasions		
	<i>Hedylepta</i>	23	1		
	<i>Oeobia</i>	44		1	
Scopariinae	<i>Scoparia</i>	61	1?		
Crambinae	<i>Orthomecyna</i>	14			1
	<i>Mestolobes</i>	33			1
	<i>Tulla</i>	1			1
	<i>Tamsica</i>	6			1
Phycitinae	<i>Genophantis</i>	2		1	
	<i>Homoeosoma</i>	1		1	
	<i>Unadilla</i>	2		1	
	<i>Rhynchephestia</i>	1		1	
Totals		190	4?	5	4

At this writing it is impossible to decide which of the groups listed as Boreal derivatives have originated in Asia (Japan, for example) or America. It is possible that the Phycitinae are American, and this may be true of the *Oeobia*; but they may be Asiatic, or partly American and partly Asiatic. The placing of *Scoparia* as a Pacific derivative is a guess.

It is significant of the isolation of Hawaii that only four subfamilies of the Pyraloidea have succeeded in becoming established and developing endemic species there.

KEY TO THE FAMILIES OF PYRALOIDEA FOUND IN HAWAII

- 1. Wings entire, never split into plumes. **Pyralidae**, p. 16.
Wings split into plumes or lobes. 2
- 2. Fore wings divided into two plumes; hind wings with three plumes. **Pterophoridae**, p. 388.
Both pairs of wings divided into six plumes. . **Alucitidae**, p. 412.

Family PYRALIDAE

Pyralides Linnaeus, 1758:496, 533.

Pyrales Scopoli, 1763:239.

Pyralites Latreille, 1809:192, 228; 1810:441.

Pyralida Leach, 1815:135.

Pyralidae Samouelle, 1819:254. Ragonot, 1890:440, 445. Hampson, 1918:386.

Pyralididae Forbes, 1923:523.

This family is the second largest family of moths in Hawaii, and it is outnumbered there only by the Cosmopterygidae. Forbes (1923:523) considered the Pyralidae to be the second largest family of moths, with about 10,000 described species.

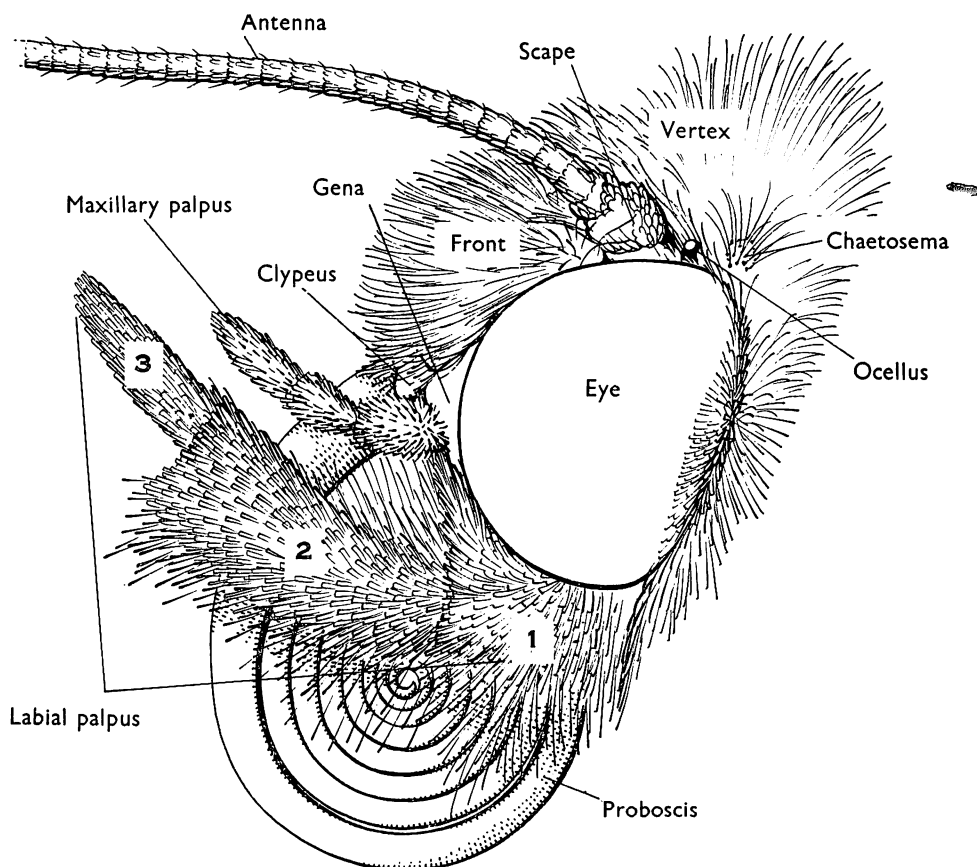


Figure 1—Head of a moth showing some parts used in classification.

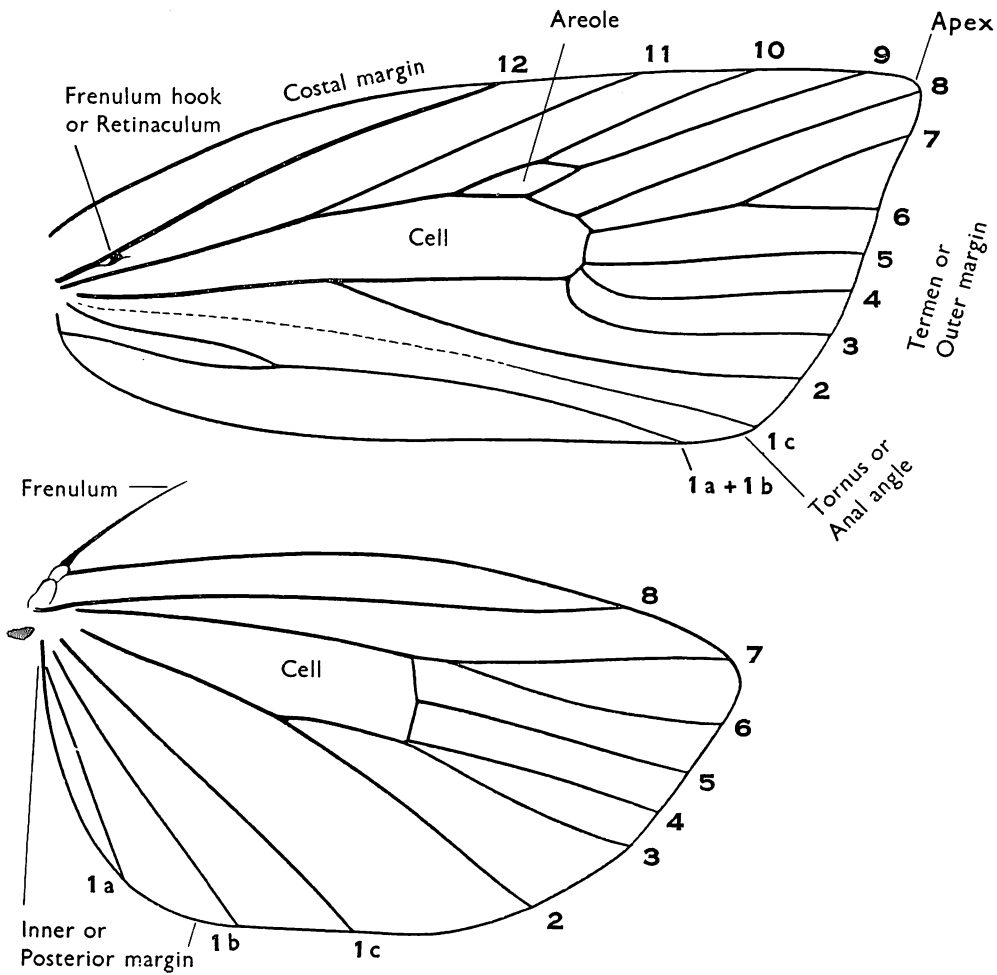


Figure 2—Fore and hind wings of a moth to show features used in classification.

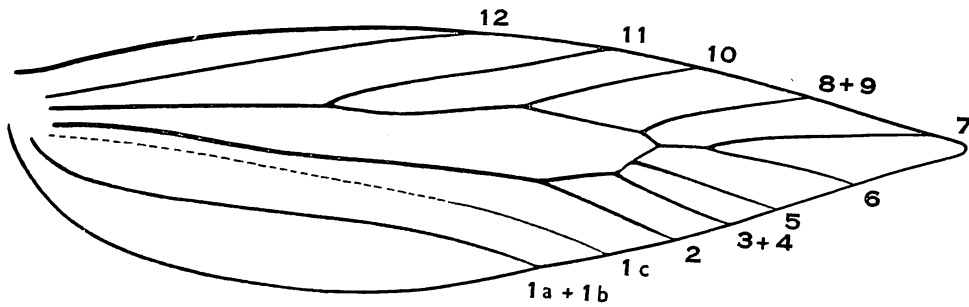


Figure 3—Fore wing of a small moth to illustrate reduced venation.

Any moth in Hawaii with all three branches of vein 1 present in the hind wing and with veins 7 and 8 fused for a considerable distance or entirely beyond the cell in the hind wing, belongs to this family. Also, if veins 7 and 8 are free beyond the cell but the chaetosemae are present (compare the *Pyalinae*, for example) the species belongs here.

KEY TO THE SUBFAMILIES OF PYRALIDAE IN HAWAII

1. Proboscis rudimentary or obsolete; ocelli absent; chaetosemae absent. **Galleriinae**, p. 23.
 Proboscis and/or ocelli present; chaetosemae present or absent. 2
- 2(1). Veins 7 and 8 in hind wing close but free (fig. 216); chaetosemae present. **Pyalinae**, p. 273.
 Veins 7 and 8 in hind wing always either partly fused or entirely fused beyond cell (figs. 20, 22, 37, etc.) 3
- 3(2). A peculiar form with termen notched and venation as in figure 274, *Tulla* part of **Crambinae**, p. 277.
 Termen normal, never notched. 4
- 4(3). Fore wing with only eleven or fewer veins, vein 7 always absent; chaetosemae present. **Phycitinae**, p. 352.
 Fore wing with all twelve veins present (check forking of 8 and 9 carefully, in some examples one branch may be quite small and easily overlooked), vein 7 always present. 5

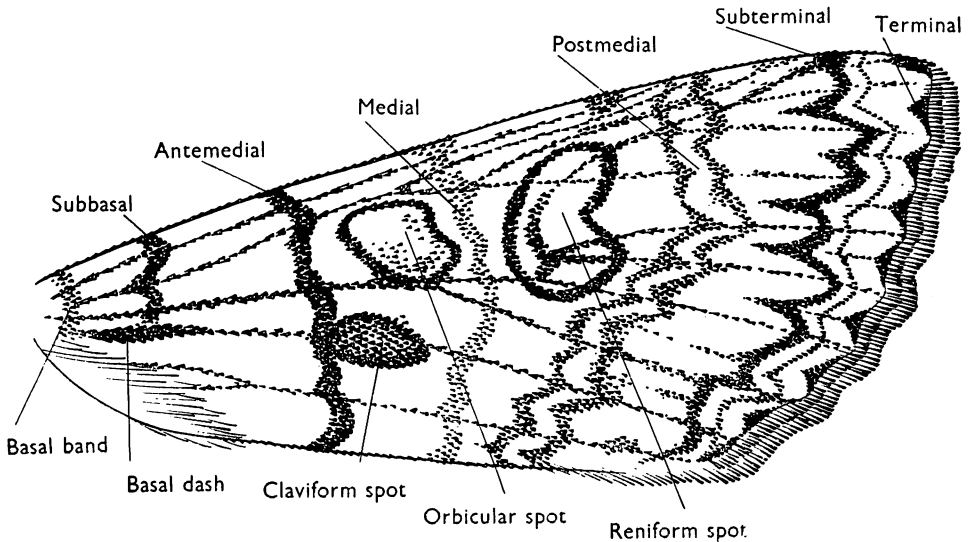


Figure 4—Fore wing of a moth to illustrate some of the markings used in classification.

- 5(4). Vein 1a in fore wing always forming a loop, curved forward and joining 1b (as in fig. 92); chaetosemae absent. **Pyraustinae**, p. 33.
 Vein 1a in fore wing never forming a loop. 6
- 6(5). Hind wings with medial vein (posterior or lower margin of cell) distinctly clothed with long hair, at least basad, the hairs usually forming a dense line (pecten); chaetosemae present. **Crambinae**, p. 277.
 Hind wings never with such a development of hairs along medial vein, although the general area may be clothed with long hairs, the vein itself never bears a pecten (check carefully; this may be a confusing character). . . . 7
- 7(6). Vein 3 absent in hind wing (*Mestolobes*, *Promylaea*). part of **Crambinae**, p. 277.
 Vein 3 present in hind wing. 8
- 8(7). Labial palpi very long, porrect and beak-like, usually twice as long as diameter of an eye; maxillary palpi large and usually rather broadly subtriangularly scaled; chaetosemae present. **Scopariinae**, p. 203.
 Labial palpi not much longer than diameter of an eye, upturned, not beak-like; maxillary palpi not subtriangularly scaled. 9
- 9(8). Maxillary palpi larger than apical segment of labial palpi, moderately rough scaled and definitely not filiform; chaetosemae present. **Nymphulinae**, p. 266.
 Maxillary palpi smaller than apical segment of labial palpi and filiform; chaetosemae absent; (*Hellula*). part of **Pyraustinae**, p. 33.

Notes on key: Our Nymphulinae will not fit into the usual keys to subfamilies. The character of the stalking of veins 8, 9 and 10 as used in various texts to separate the Nymphulinae will not work for the Hawaiian species. *Hellula* does not have the looped vein 1a in the fore wing, and it is an atypical member of our Pyraustinae. Our *Scoparia* will not fit into their subfamily in a number of the published subfamily keys I have tried; they do not have the rough scaling in the cell of the fore wing which some authors consider typical (but that opinion is in need of revision).

The larvae of the Hawaiian pyralids are poorly known, with the exception of the *Hedylepta* leafrollers and a few other species of economic importance. What we do know about them is almost entirely the result of Dr. Swezey's observations. It is not possible now to present a key even to the genera. Dr. Swezey (1944:142) prepared a key to nine species occasionally or commonly found about house and garden, and I have adapted his key for use here; but the key needs improvement. I am, unfortunately, able to say little about the larvae of the endemic species.

KEY TO THE LARVAE OF SOME PYRALIDAE FOUND ABOUT HOUSES OR
GARDENS IN HAWAII

1. Mesothorax with a dark sclerotized ring at base of seta I Ib (or "rho," or "SD1" of Hinton) (this is a subdorsal seta, and easily distinguished by the sclerotized ring about its base if your species belongs here, otherwise go to 5).....2
- Mesothorax without such a sclerotized ring at base of seta I Ib.....5
- 2(1). Abdominal segments with rather large sclerotized plates at bases of setae I and II (on the sides of the segments there are three setae above each spiracle: the one nearest above the spiracle is called III, and at a distance dorsad of III, and in a longitudinal or somewhat oblique line, are situated setae I and II).....*Ectomyelois ceratoniae* (Zeller).
- Not so, abdominal segments with setae I and II with only small pigmented areas at base.....3

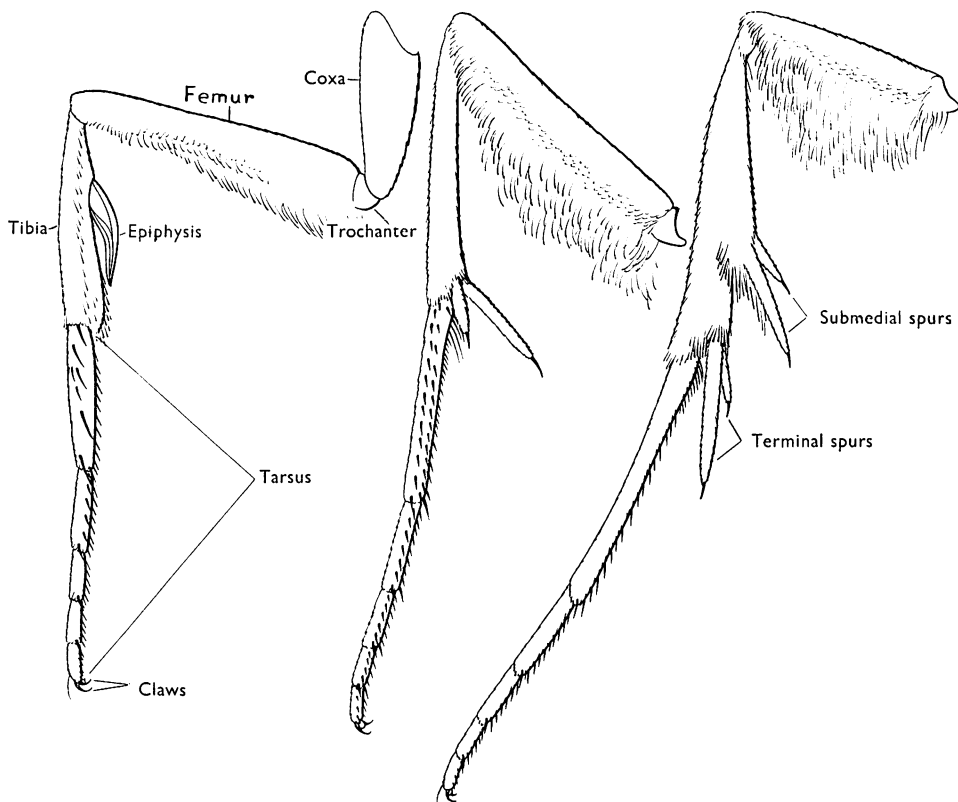


Figure 5—The legs from one side of a moth. From left to right: Fore, mid, and hind.

- 3(2). Abdominal segments with small pigmented plates at bases of setae I and II, and each set in a white circle; dorsum more or less fuscous.

..... **Cryptoblabes aliena** Swezey.

The small pigmented areas at bases of setae I and II of abdominal segments not set in white circles. 4

- 4(3). Abdominal segment 8 with seta IV (the seta just caudad of the spiracle) separated from the spiracle by a distance about equal to the diameter of a spiracle.

..... **Ephestia cautella** (Walker).

This seta separated from the spiracle about two or three times the diameter of a spiracle.

..... **Ephestia elutella** (Huebner).

- 5(1). Mesonotum and metanotum each with a pair of sclerotized plates (not containing setae) at caudal margin; in bean pods. **Maruca testulalis** (Geyer).

Metathorax without such plates. 6

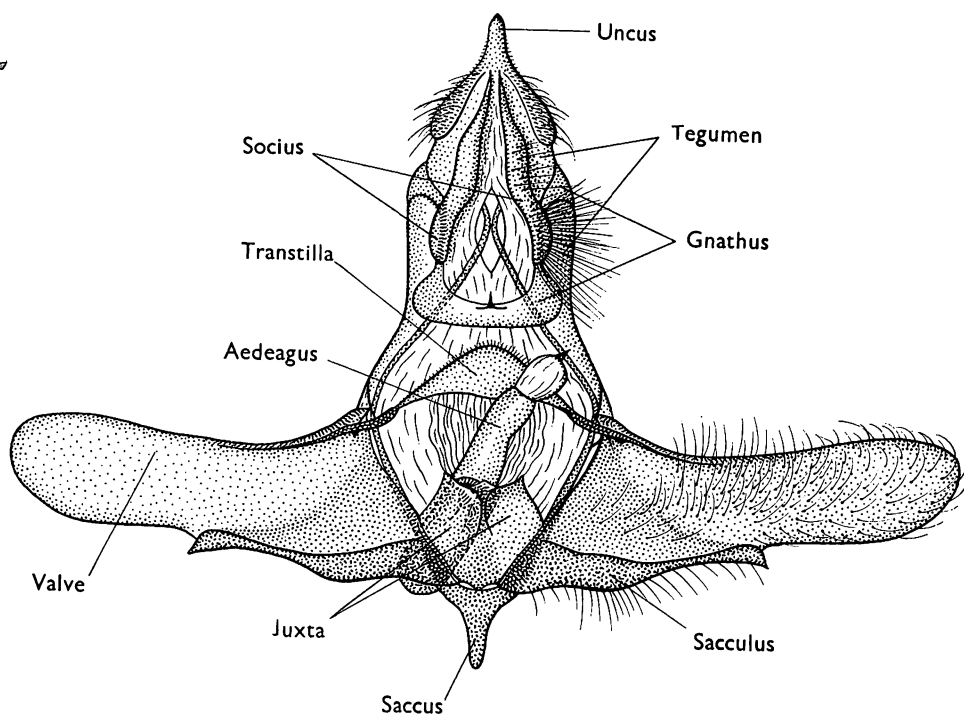


Figure 6—Male genitalia of a moth, spread open. (Modified from Torre-Bueno.)

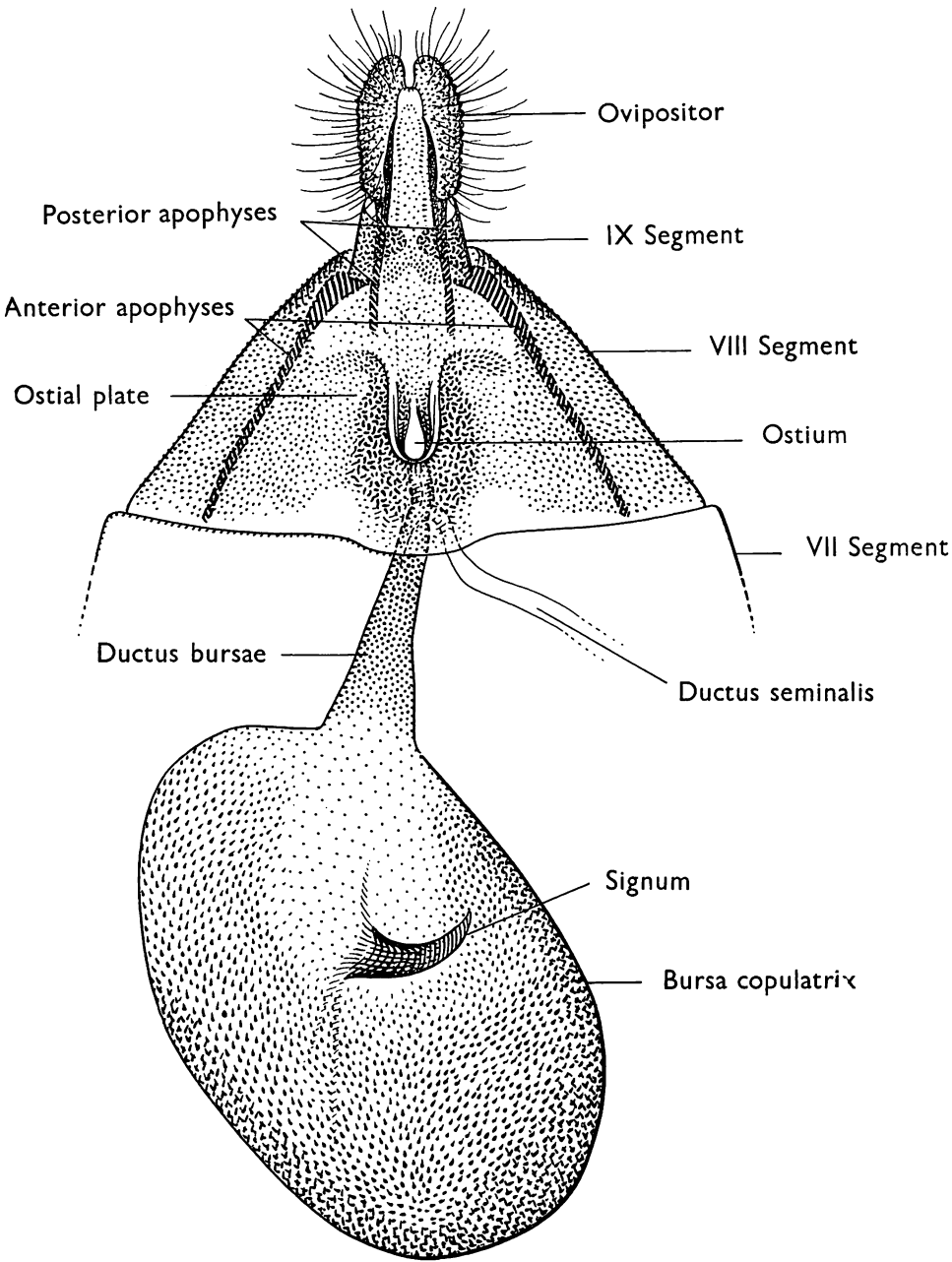


Figure 7—Female genitalia of a moth.

- 6(5). Mesonotum with a pair of sclerotized plates at hind margin (which do not include setae); abdominal setae situated in large, brown, sclerotized plates; bores in sweetpotato vines and tubers. ***Omphisa anastomosalis*** (Guenée).
 Mesonotum without such plates; not on sweetpotato. 7
- 7(6). Prothoracic shield with two black marks on each side, the posterior one largest; on leaves of beets, amaranth and other plants. ***Hymenia recurvalis*** (Fabricius).
 Prothoracic shield testaceous, unmarked; in stored cereals, nuts and dried fruits. ***Plodia interpunctella*** (Huebner).

Subfamily GALLERIINAE Zeller, 1848

For classification, see Ragonot (1901) and Hampson (1917). Ocelli and chaetosemae are absent in this subfamily.

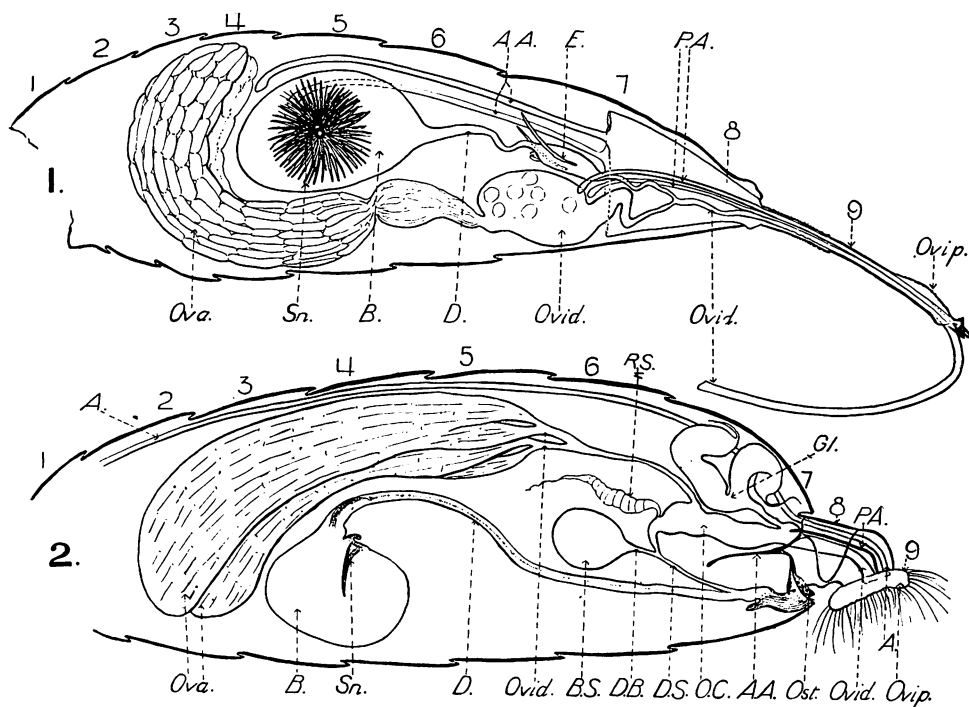


Figure 8—Schematic longitudinal sections through the abdomens of a moth with one sex opening (1), and one with two sex openings (2). Abbreviations: 1–9, the abdominal segments; A, alimentary canal; A.A., anterior apophyses; B, bursa copulatrix; B.S., bulla seminalis; D, ductus bursae; D.B., ductus bullae; D.S., ductus seminalis; E, enlarged part of ductus bursae; Gl., gland; O.C., common oviduct; Ost., ostium; Ova., ovaries; Ovid., oviducts; Ovip., ovipositor; P.A., posterior apophyses; R.S., receptaculum seminalis; Sn., signum. (After Busck, 1931.)

KEY TO THE GENERA OF GALLERIINAE FOUND IN HAWAII

1. All eight veins present in hind wings; fore wings with twelve veins. **Galleria.**
Only seven veins in hind wings; fore wings with eleven or twelve veins. 2
- 2 (1). Fore wings with twelve veins. **Aphomia.**
Fore wings with only eleven veins. 3
- 3 (2). Fore wing with vein 3 present, vein 7 (or 8) absent. **Achroia.**
Fore wing with vein 3 absent, veins 7 and 8 present. **Coreyra.**

Genus **GALLERIA** Fabricius, 1798

For description and synonymy, see Ragonot (1901:447) and Hampson (1917:53).

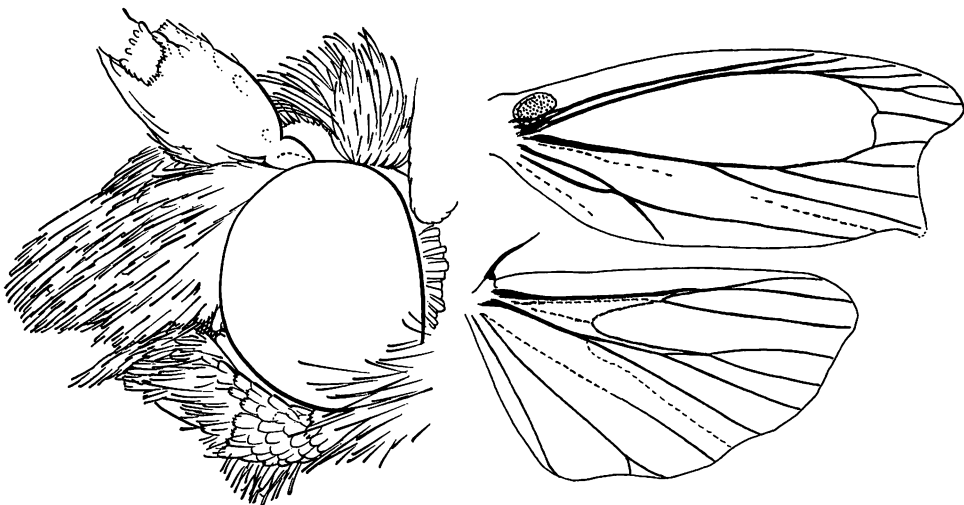


Figure 9—Head (left) and wing venation (right) of *Galleria mellonella* (Linnaeus).

Galleria mellonella (Linnaeus) (figs. 9, 10).

Phalaena Tinea Mellonella Linnaeus, 1758:537.

For synonymy, see Ragonot, 1901:448, Hampson, 1917:53, and Corbet and Tams, 1943:72, figs. 25, 79, 80, 126.

The bee moth or wax worm; the honeycomb moth.
Oahu, Maui.

Immigrant. First found in Hawaii by G. Wilder at Honolulu in 1930. Nearly cosmopolitan; an Old World species.

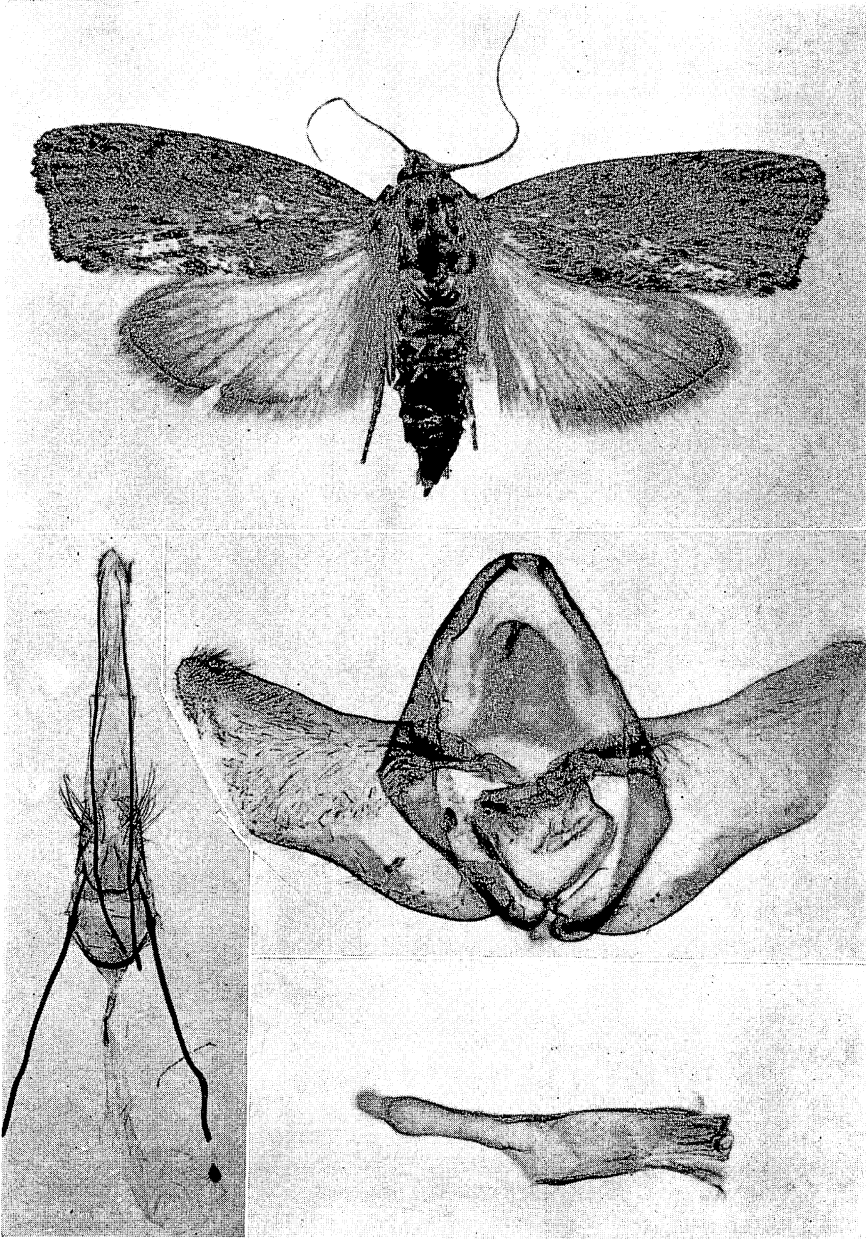


Figure 10—*Galleria mellonella* (Linnaeus). Above: A female from Wailuku, Maui; fore wing length, 13 mm.; the shape of the fore wing is variable. Female genitalia, left. Male genitalia at right, with aedeagus at bottom.

This widespread species is a pest of economic importance to the beekeeper, and its attacks may cause serious damage, especially to colonies of bees which are weak or are not well attended by the apiarist. The larvae tunnel in the comb, feeding upon the wax and debris left by the bees, lining their tunnels with silk as they go. If allowed to progress, the attacks may result in virtual destruction of the comb. In any case, the infestation will cause real damage and make a messy condition within the hive. All old combs should be melted or destroyed, and care should be taken to see that hives or parts which are not in use do not become infested. One of the best ways to control the moth is to prevent its becoming established in the apiary by using good principles of sanitation and inspection. All old wax, scrapings from the hives and other debris should be destroyed or infestation is invited.

There have been a number of parasites recorded elsewhere on this species; see Thompson (1946:259) for a list of parasites.

For colored plate of eggs, larvae, pupa, cocoon and adults, see Fletcher (1914:421). For details of larva, see Peterson (1948:200, figs. L 49, I-M).

Genus **ACHROIA** Huebner, 1827

See Ragonot (1901:496) and Hampson (1917:44) for description and synonymy.



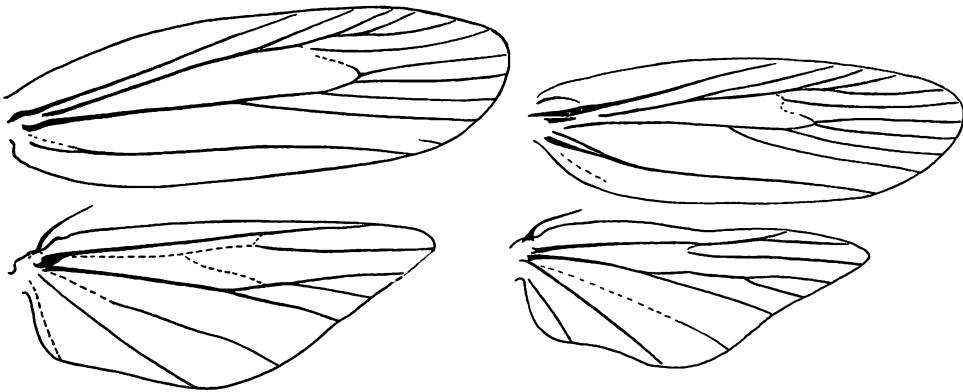
Figure 11—Head of *Achroia grisella* (Fabricius).

Achroia grisella (Fabricius) (figs. 11, 12, 13).*Tinea grisella* Fabricius, 1794:289.*Tinea anticella* Walker, 1863:483.*Meliphora grisella* (Fabricius) Meyrick, 1899:197.*Achroia grisella* (Fabricius) Ragonot, 1901:497. Hampson, 1917:44. Corbet and Tams, 1943:72, figs. 26, 81, 82, 127, 163, and synonymy.

The lesser bee moth; the honey moth.

Kauai, Oahu, Hawaii.

Immigrant. First found in Hawaii by Blackburn. An Old World species which is now nearly cosmopolitan.

Figure 12—*Achroia grisella* (Fabricius). Wing venation of two examples.

The habits of this species are much like those of *Galleria mellonella* reported above, and it may become a pest in bee hives. It, like *Galleria*, maintains itself in colonies of bees which have escaped to the wild. Forbes (1923:535) reports that it "will also eat dried apples, raisins, crude sugar, and apparently also dried insects."

See Corbet and Tams (1943:4–6, figs. 7 and 8, pl. 1, figs. 9 and 10) for taxonomy and discussion; Thompson (1944:6) for list of parasites; and Peterson (1948:200, figs. L 45, D–H) for larva.

Genus **APHOMIA** Huebner, 1825*Paralispa* Butler, 1879:454.

For description and synonymy, see Ragonot (1901:470, 473) and Hampson (1917:37).

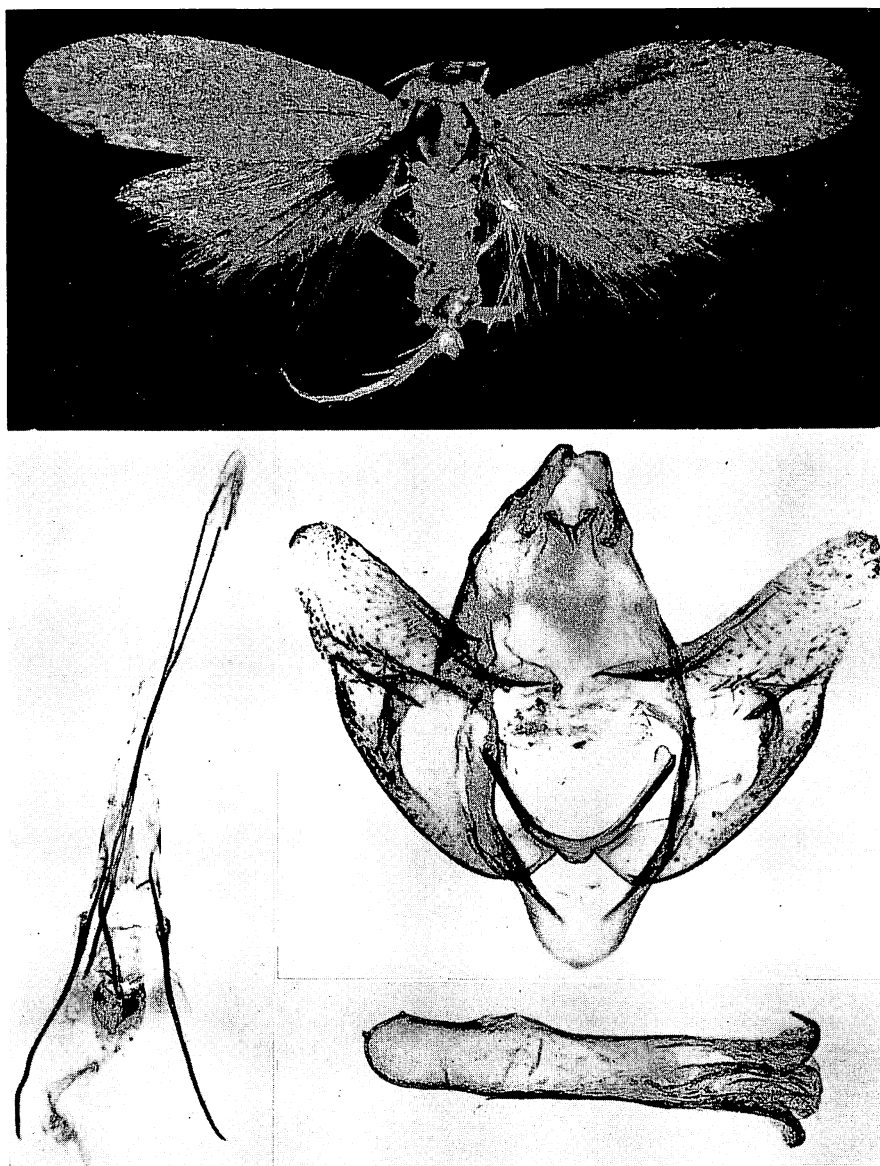


Figure 13—*Achroia grisella* (Fabricius). Above: A male; length of a fore wing, 8 mm.; Waianae Mts., Oahu. Below: Female and male genitalia.

***Aphomia gularis* (Zeller) (figs. 14, 15, 16).**

Melissoblaptēs gularis Zeller, 1877:74.

Paralispa modesta Butler, 1879:455. Type of *Paralispa*. Ragonot, 1901:474, pl. 43, fig. 25.

Melissoblaptēs tenebrosus Butler, 1879:78, pl. 60, fig. 1. Corbet and Tams, 1943:76, figs. 95, 96, 134, 170.

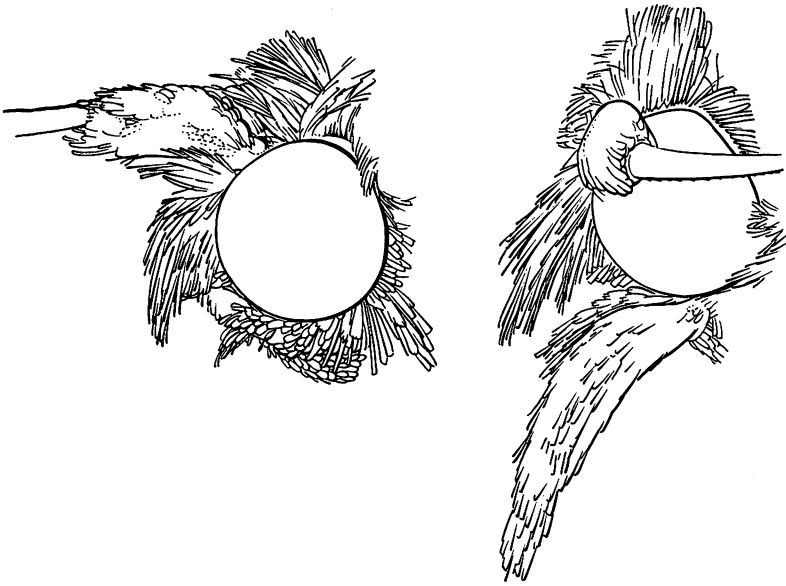


Figure 14—*Aphomia gularis* (Zeller). Head of male, left; female, right.

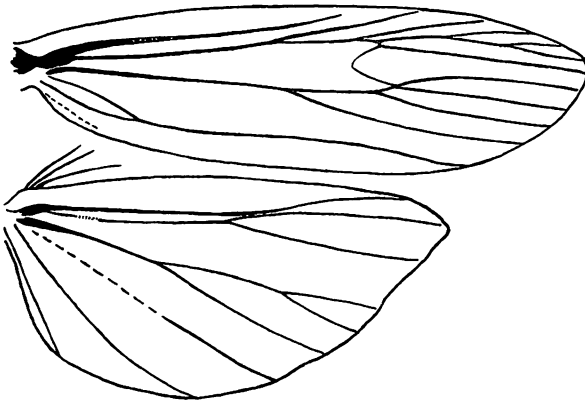


Figure 15—*Aphomia gularis* (Zeller). Wing venation.

Oahu.

Immigrant. A widespread Asiatic-Oriental species. First found in Hawaii by E. M. Ehrhorn at Honolulu in a shipment of rice from Japan. This species may not be established in Hawaii.

Hostplant: Rice (recorded elsewhere on seeds and nuts).

Swezey, who made the original determination, said that the larva is larger than

that of *Ephestia elutella*, "dirty whitish, with two or three of the segments at either end tinged with fuscous; head reddish; tubercles minute, fuscous."

The male has a huge, silken tuft of golden hairs on the under side of the fore wing. It arises from near the base and, when not expanded, lies in an elongate, sac-like fold along the fore edge of the wing.

See Thompson (1944:54) for references to two parasites.

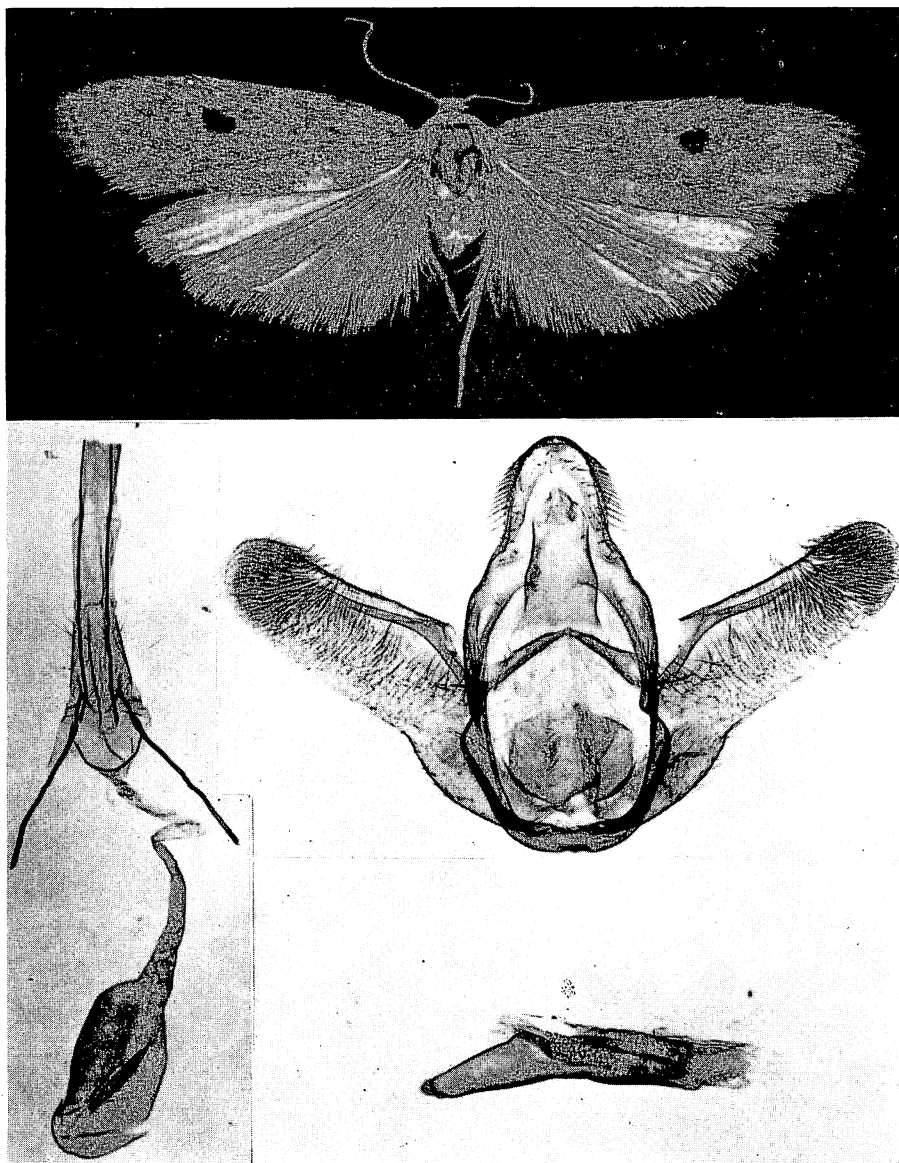


Figure 16—*Aphomia gularis* (Zeller). Fore wing length of top figure, 9 mm.; a Hawaiian example. Below: Left, female genitalia (apex of ovipositor broken), Australia. Right, male genitalia, "Omei-Shan," aedeagus at bottom right.

Genus **CORCYRA** Ragonot, 1885

This generic name is the ancient name of Corfu. For description and notes, see Ragonot (1901:491) and Hampson (1917:35).

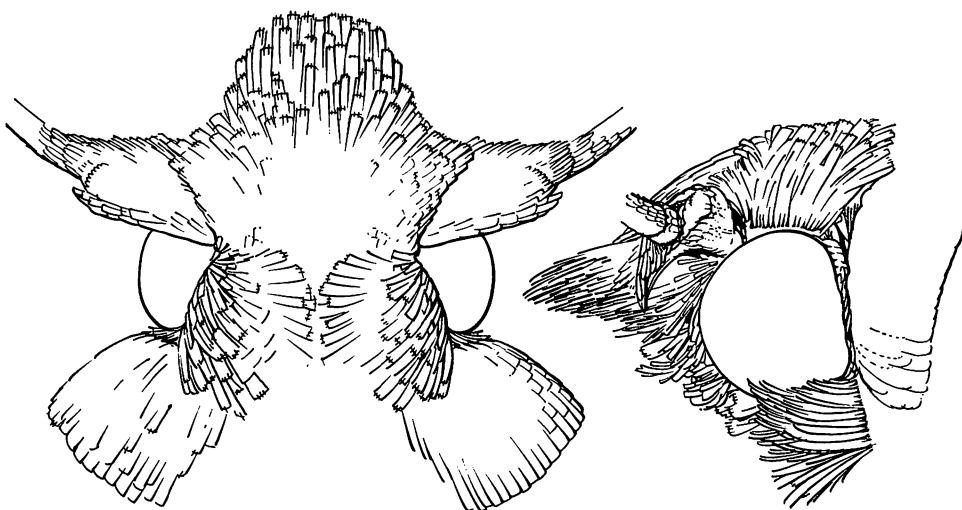


Figure 17—Dorsal and lateral view of head of *Corcyra cephalonica* (Stainton).

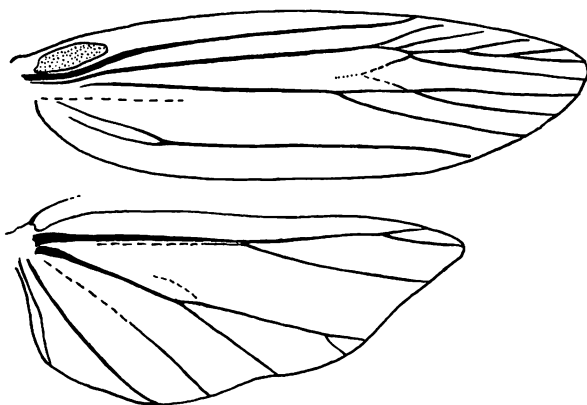


Figure 18—Wing venation of *Corcyra cephalonica* (Stainton).

Corcyra cephalonica (Stainton) (figs. 17, 18, 19).

Melissoblaptes (?) *Cephalonica* Stainton, 1866:172.

Melissoblaptes oeconomellus Mann, 1872:35.

Corcyra cephalonica (Stainton) Ragonot, 1885:23; 1901:491, pl. 45, fig. 23.

Corbet and Tams, 1943:76, figs. 27, 85, 86, 129, 165, and synonymy.

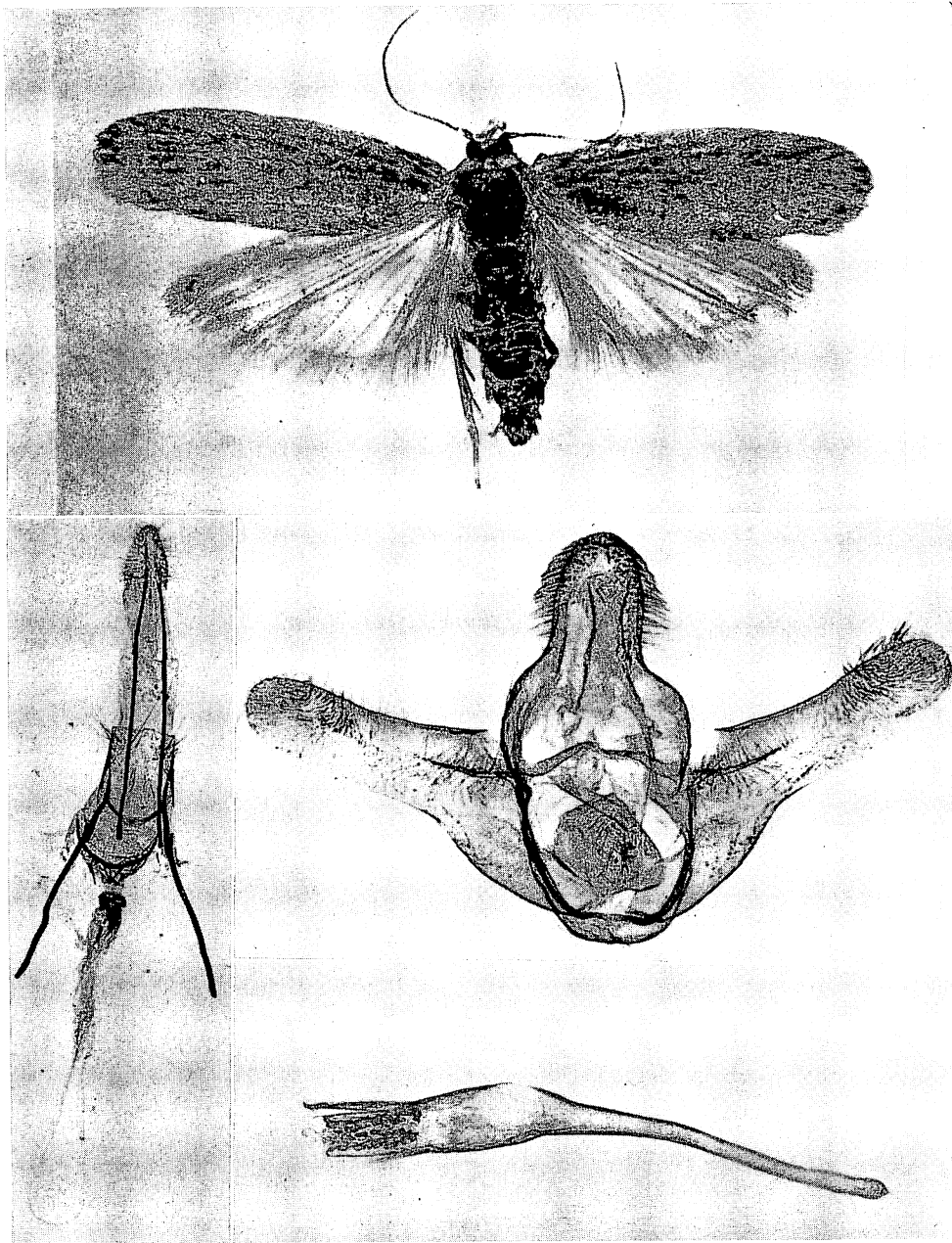


Figure 19—*Corcyra cephalonica* (Stainton). Above: A specimen from a Honolulu feed warehouse; right fore wing, 13 mm. long. Female genitalia, left, Formosa. Male genitalia, Fiji.

Oahu.

Immigrant. Nearly cosmopolitan. In the Pacific it has been found in Malaya, Java, Formosa, Australia, New Guinea, Fiji, Samoa and elsewhere. It was first found in Hawaii by J. Kotinsky, who discovered it breeding in a feed warehouse in Honolulu in 1908 (Swezey, 1913:212). It was originally described from examples bred from dried currants in England.

Hostplants: A feeder on grains and dried foods.

Parasite: *Stomatoceras pertorvum* Girault. See Thompson (1945:158) for references to other parasites.

This species has not often been collected in Hawaii.

Subfamily PYRAUSTINAE Meyrick, 1890

Hampson, many papers, various dates.

This subfamily is in chaos, not only in our fauna, but also the world over, and the whole subfamily is in urgent need of revision. The extensive works of Hampson have done possibly more to confuse the issues than to clarify them. Perhaps most of the long list of genera submerged by Hampson under *Pyrausta*, for example, are good genera. Many of the common species, including such well-known economic pests as the European corn borer, are now incorrectly assigned generically. A study of the discussion under the genus *Oeobia*, below, will serve as a good example of the confusion that may be uncovered by critical examination of internal as well as external characters.

In this subfamily the ocelli are present, but chaetosemae are wanting.

KEY TO THE GENERA OF PYRAUSTINAE FOUND IN HAWAII

1. Fore wing with vein 1a free at apex and not joining 1b (fig. 20)..... **Hellula.**
Fore wing with vein 1a always looped upward at end and joining 1b (fig. 92), (examine your specimens carefully and descale and clear the wing if required)..... 2
- 2(1). Wings long and narrow; legs very long, hind tibia plus tarsus as long as a fore wing; species strongly resembling Pterophoridae, but without split wings; hind wing with veins 3 and 4 arising from 5 and not free (rather easily confused with *Hyperectis*, which compare)..... **Lineodes.**
Hind wings with veins 3, 4 and 5 free to base and all arising from lower corner of cell; wings long and narrow and rather pterophorid-like only in *Hyperectis*..... 3
- 3(2). Posterior margin of fore wing and costal margin of hind wing very strongly and conspicuously sinuous (fig. 28)..... **Terastia.**
Not so..... 4

- 4(3). Tarsal claws simple, slender, without a tooth beneath; apex of cell in fore wing in our species far beyond middle of wing **Nomophila.**
 Tarsal claws appendiculate, that is, with a broad tooth beneath; apex of cell only a little beyond middle of wing 5
- 5(4). Species with wings very long and narrow, as in figure 26; antennae about as long as a fore wing, strongly annulated, the annular ridges strongly protuberant; hind tibia plus tarsus about as long as a fore wing . . **Hyperectis.**
 Not such species 6
- 6(5). Labial palpus with segment 3 distinctly separated from segment 2, narrowly elongate-ovate or broadly awl-shaped, never incorporated into general contour of segment 2; palpi never strongly elongate-drooping-porrect 7
 Labial palpus with segment 3 almost or entirely incorporated into general contour of segment 2, never, in perfect state, standing independently erect and elongate beyond segment 2, usually indistinct; palpi often strongly elongate-drooping-porrect 9
- 7(6). Outer spurs on hind tibiae about four-fifths as long as inner spurs, obviously more than half as long as inner spurs; labial palpi curved strongly upward; males with each antennal scape conspicuously enlarged by a mass of heavy, specialized scales and with base of shaft notched **Hymenia.**
 Outer spurs on hind tibiae at most only one-half as long as inner spurs; labial palpi slanting-porrect; male antennae without such basal specialization in our species . . 8
- 8(7). Maxillary palpi unusually large, apically expanded, as long or longer than frontal distance between eyes, extending to apex of second labial palpal segment; fore wing with veins 4 and 7 rather evenly arcuate, not strongly curved basad **Omphisia.**
 Maxillary palpi small, obviously shorter than frontal interocular distance and not reaching apex of second labial palpal segment; fore wing with vein 4 more strongly curved basad and running near 5 for about one-fourth its length, vein 7 strongly arched basad and running very close and parallel to 8 for basal fourth **Maruca.**
- 9(6). Second segment of labial palpus broadly and subtriangularly expanded, third segment lying on top of second and at the corner nearest head—not at apex; labial

- palpi with inner edge curved upward around front of eye, never elongate-porrect. 10
- Third segment of labial palpus incorporated in vestiture at apex of second, and if second is somewhat subtriangularly expanded, then always at apical corner farthest removed from head; labial palpi often very elongate-porrect. 11
- 10(9). Fore wing vein 7 arched and running close and parallel to 8 for about one-fourth its length (one green species and one species with purplish reflections in Hawaii). **Margaronia.**
- Fore wing with vein 7 shallowly arcuate, diverging from 8 from origin (none green and none with purplish reflections in Hawaii). **Hedylepta.**
- 11(9). Fore wing with vein 6 arising very near 7, as in figure 86. **Uresiphita.**
- Fore wing with vein 6 arising approximately midway between 5 and 7, as in figure 92. **Oeobia.**

Notes on the key: I have found no previous mention that *Nomophila* has simple claws; this is unusual for this group. *Hellula* is aberrant, because it does not have the looped character of vein 1a in the fore wing, which is otherwise diagnostic for the subfamily in Hawaii. I have found almost no mention of this character in literature, but it is of real value in our fauna. Forbes (1927:331–339) comments on the vein. *Hellula* may not be correctly placed here. Also, *Lineodes* appears out of place here; the pecten should be noted.

Genus **HELLULA** Guenée, 1854:415

As pointed out before, this is the only genus in the Pyraustinae in Hawaii which does not have a looped vein 1a in the fore wings, and its taxonomic position needs further checking.

Hellula undalis (Fabricius) (figs. 20, 21). Type of *Hellula* by original designation.

Phalaena undalis Fabricius, 1794:226.

I have not worked out the detailed synonymy, but see Hampson, 1898:760, fig. 87; Fletcher, 1914:438, fig. 314; and Klima, 1939:309.

The cabbage webworm.

Kauai, Oahu, Molokai, Maui, Hawaii.

Immigrant. A widespread species first described from Italy. It was first reported from Hawaii by Meyrick (1899:227) from examples taken earlier by Perkins on Kauai and Oahu.

Hostplants: Broccoli, crucifers, head cabbage, Chinese cabbage, spoon cabbage, daikon radish, horseradish, mustard, radish, turnip.

Parasite: *Chelonus blackburni* Cameron (oviposits in the egg, but larval development not completed until caterpillar has made its cocoon, then the parasite larva issues and spins a white cocoon within the cocoon of the moth). See Thompson (1946:290) for notes on parasites.

This is a serious pest of crucifers and is considered a major pest of turnip, radishes, mustard and cabbages at lower elevations. Dr. Swezey has kindly given me some notes to incorporate here: The small caterpillars mine the leaves, bore the stems and also feed more or less on the surface of the leaves. They tend to penetrate the heart of the plant, thus destroying the terminal bud and preventing heading. They spin a silken tunnel as they work. The caterpillar is 12 to 15 mm. long, whitish with pinkish-brown longitudinal stripes, without sclerotized plates at bases of setae; head black with distinct whitish line along adfrontal suture and extending to vertex; prothoracic shield very pale testaceous, with a small, dark spot towards each lateral margin and a pair of dark spots on posterior margin near medial line, setae situated in minute dark rings; other body segments without distinctive markings; spiracles minute, circular, with dark rings. The pupa is

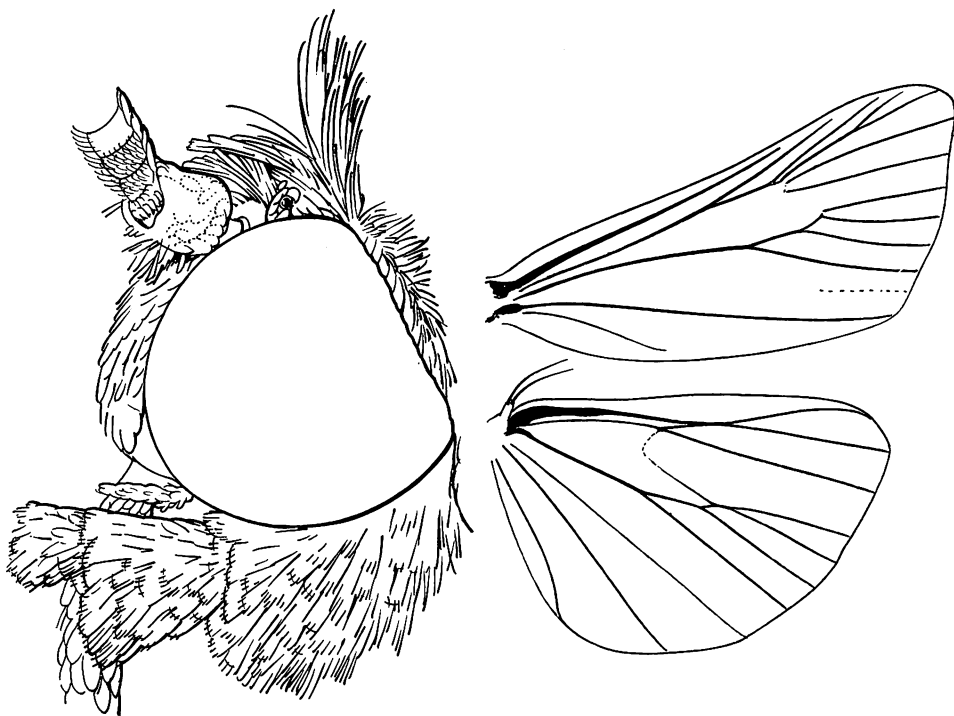


Figure 20—Head (left) and wing venation (right) of *Hellula undalis* (Fabricius).

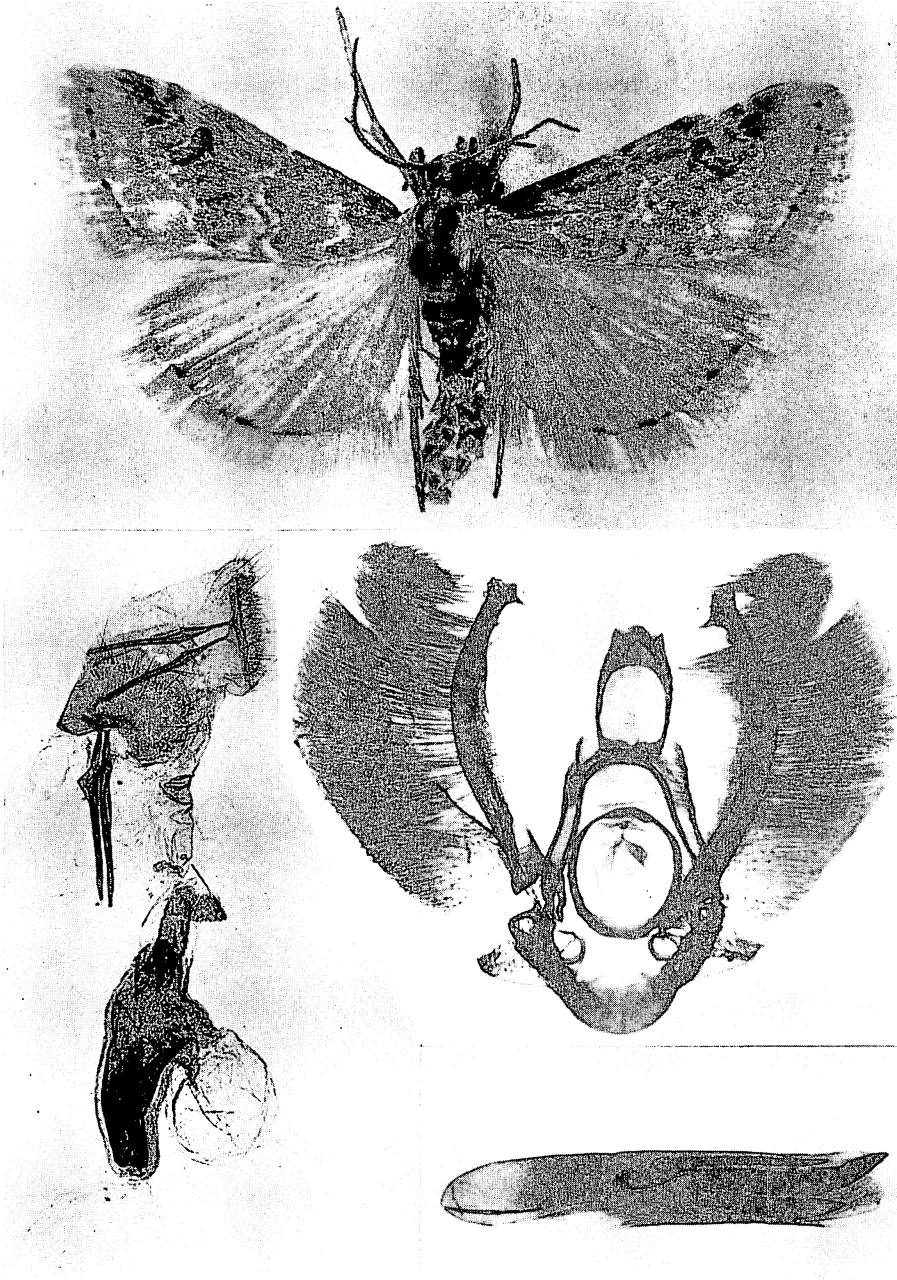


Figure 21—*Hellula undalis* (Fabricius), Honolulu, length of a fore wing, 8 mm.; female genitalia, Kauai; male genitalia, Waianae Coast, Oahu.

formed in a loose cocoon of webbed-together particles of soil or other matter and is about 8 mm. long, shining pale brown with a dark stripe on the back; cremaster with four rather long, recurved setae. For illustrations of the caterpillar, see Peterson (1948:210, figs. L 50, O-Q).

The caterpillars may be controlled by rotenone or cryolite dusts.

Shibuya (1928:246) erroneously designated this species as type of *Oeobia*, but it was originally selected as the type of *Hellula* when Guenée erected the genus. For discussion of the problem, see my comments under *Oeobia* below.

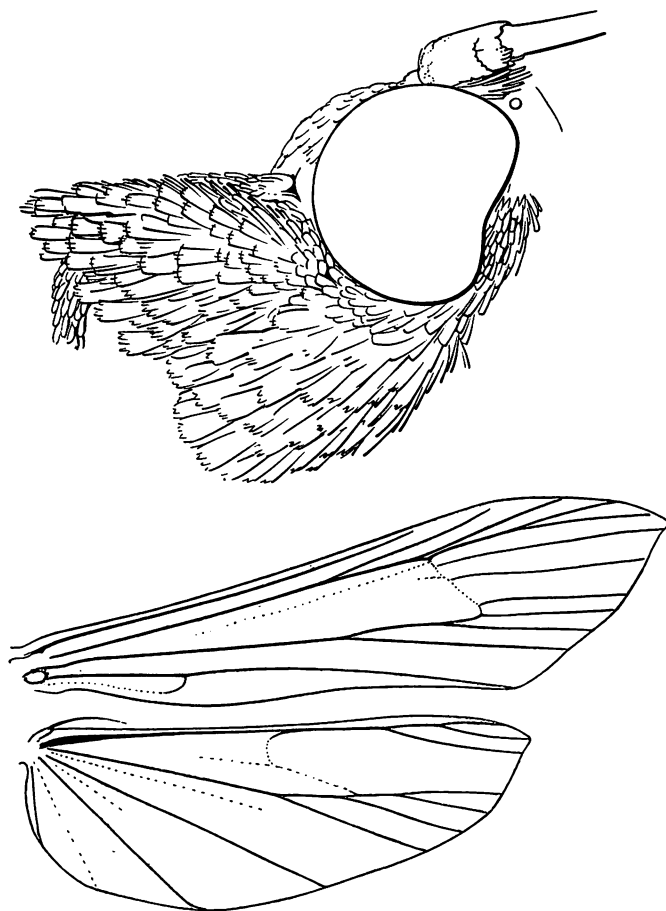


Figure 22—Head and wing venation of *Lineodes ochrea* Walsingham.

Genus **LINEODES** Guenée, 1854

This genus ranges from South America through Mexico with a few species in the southern United States. Its members have a pterophorid-like appearance, and in our fauna they resemble *Hyperectis*. The hind wings have strong pectens. The genus seems out of place here.

Lineodes ochrea Walsingham (figs. 22, 23, 24).

Lineodes ochrea Walsingham, 1907:469, pl. 10, fig. 1.

Lineodes subextincta Walsingham, 1907:470, pl. 10, fig. 2. **New synonym.**

Kauai (type locality: 3,000 to 4,000 feet), Oahu, Molokai, Hawaii.

Immigrant. Although this species has not been recorded elsewhere, I believe that it is an immigrant from America.

Hostplant: Eggplant.

Parasite: *Chelonus blackburni* Cameron.

I have reduced *subextincta* to synonymy, because I found, upon studying the types in the British Museum, that *ochrea* was the female and *subextincta* the male of the same species.



Figure 23—*Lineodes ochrea* Walsingham, type female; expanse, 21 mm.; Kauai mountains, 3,000–4,000 feet.

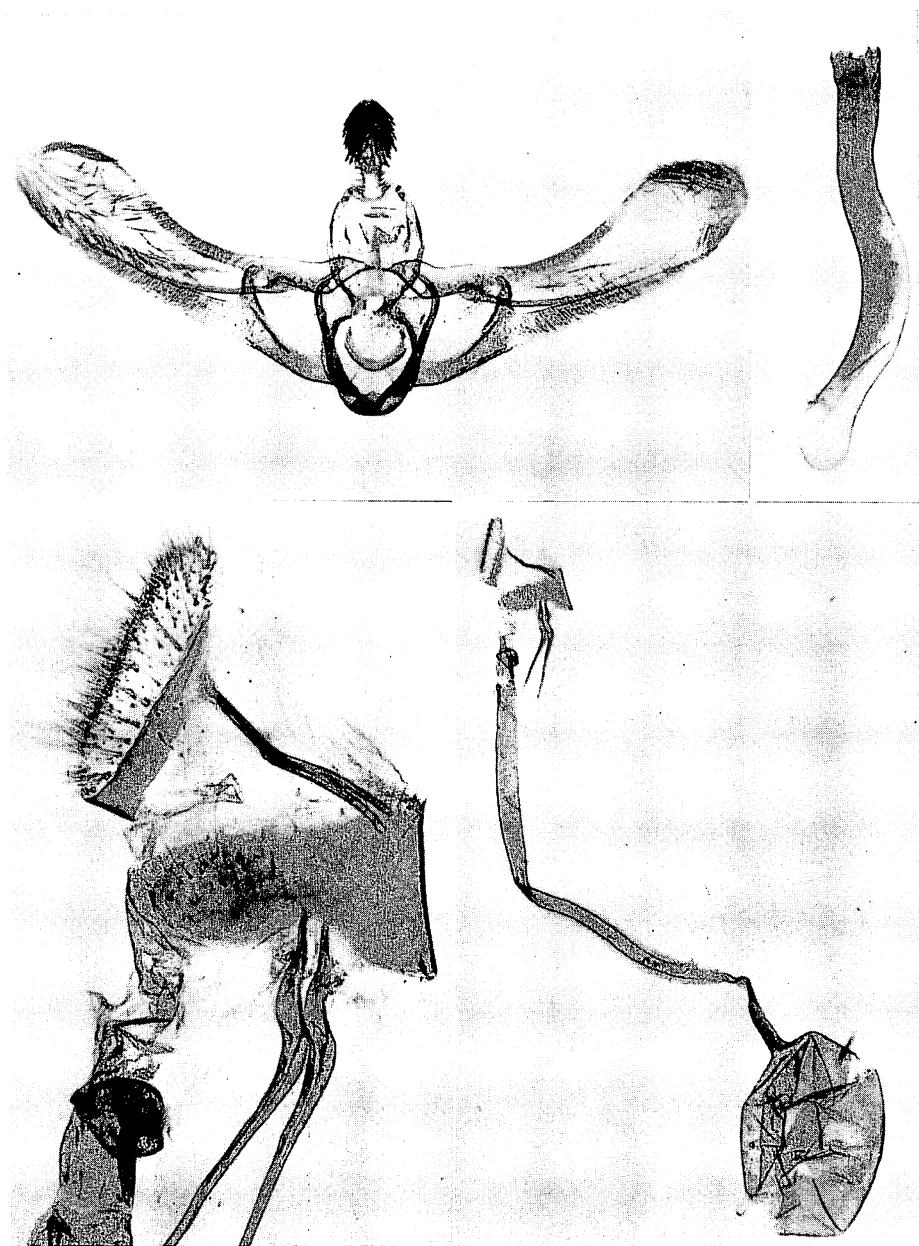


Figure 24—*Lineodes ochrea* Walsingham, male and female genitalia; Kauai examples. The female genital plate is folded.

Genus **HYPERECTIS** Meyrick, 1904:356

A confusing state of affairs exists concerning this monotypic genus which is known only from Hawaii, and an outline of my notes on the situation is given below.

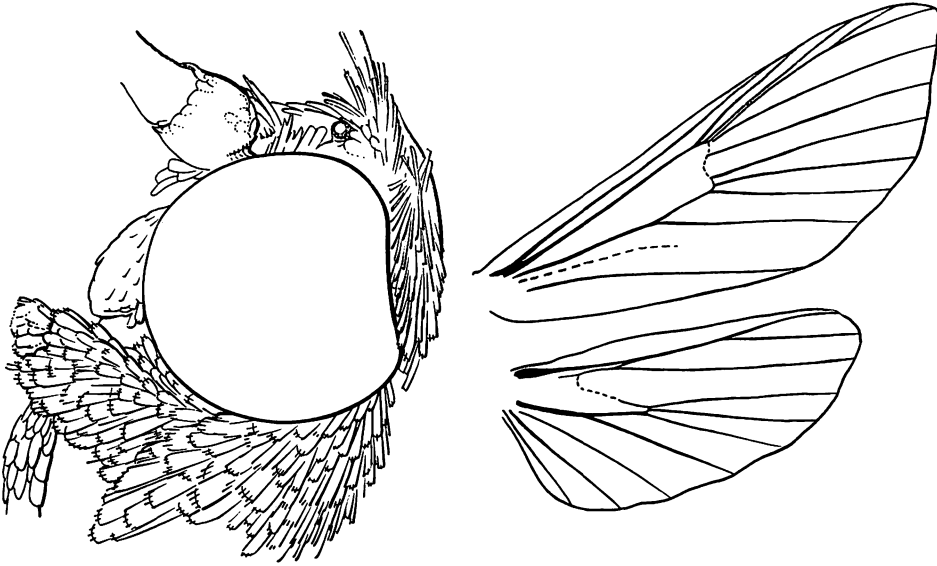


Figure 25—*Hyperectis dioctias* Meyrick, head and wing venation.

Hyperectis dioctias Meyrick (figs. 25, 26, 27).

Hyperectis dioctias Meyrick, 1904:357; 1904:133. Type of the genus.

Hydriris exaucta Meyrick, 1928:95. **New synonym.**

Ercta exausta [misspelling] (Meyrick) Klima, 1939:60.

Kauai, Oahu, Maui (type locality: Iao Valley), Hawaii.

Immigrant? Not known elsewhere, but I believe that it may be an immigrant. The few examples collected have been found in the mountains.

Hostplant: Not known.

This rare species resembles our *Lineodes*, and has a rather pterophorid-like appearance. The wing venation is quite distinct, however. The male has a peculiar "bladder" under the hind wing.

Meyrick evidently forgot about describing this species as the type of *Hyperectis*, because his *Hydriris exaucta* is the same insect and must be reduced to synonymy. He stated (1928:95) "A true *Hydriris*, much larger than either of the other species of the genus . . ." *Hydriris* was described by Meyrick (*Trans. Ent. Soc. London*, 1885:443) to include his species *chalybitis* from Queensland. In *Fauna of British India* (1896:273), Hampson listed *Hydriris* as a synonym of *Ercta* Walker (1859:

425, type *hemialis* Guenée). The type of *Ercta* is from the West Indies and probably does not have anything to do with our problem. In his key to the genera of Pyraustinae, Hampson (1898:596) said "Antennae longer than forewing *Hyperectis*" and "Antennae shorter than forewing *Ercta*." Later on, when Hampson arranged the collection at the British Museum, he placed *diotias* in *Dracaenura* under "Section *Hyperectis*" in the Nymphulinae. The specimen placed there is a female which evidently had been put in an envelope after capture and has its body flattened and the head mashed, and it has been labeled as "type." It is labeled "Sandwich Is., Hawaii, Kona, 1902, Perkins," whereas Meyrick definitely stated that the type is a male from Maui—in fact, Meyrick described the species from an unique male from Maui. In another drawer, 40 drawers further along in the collection, in the Pyraustinae ("Agroterinae"), I found that Hampson had placed the true type under the genus *Hyperectis* just before *Ercta*.

I have checked the genus *Dracaenura* Meyrick, 1886:227 (type *stenosoma*, from Fiji), and find it to be so composite that it would be best to restrict the genus to the type species until the entire group can be revised. The genitalia, and other characters, show that *Dracaenura* and *Hyperectis* have nothing to do with each other.

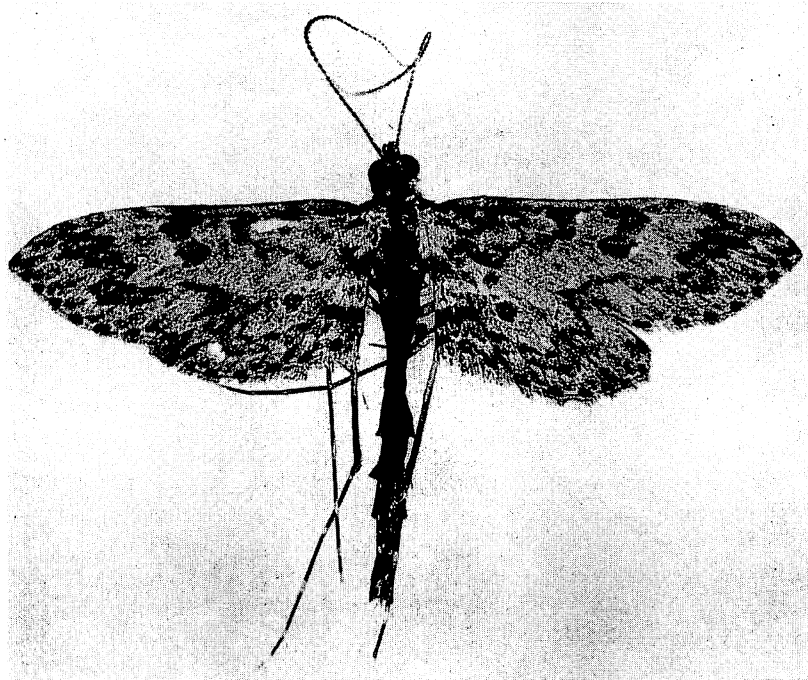


Figure 26—*Hyperectis diotias* Meyrick, from the type of the synonym *Hydriris exaucta* Meyrick; Kaholuamano, Kauai; right fore wing, 13 mm. long.

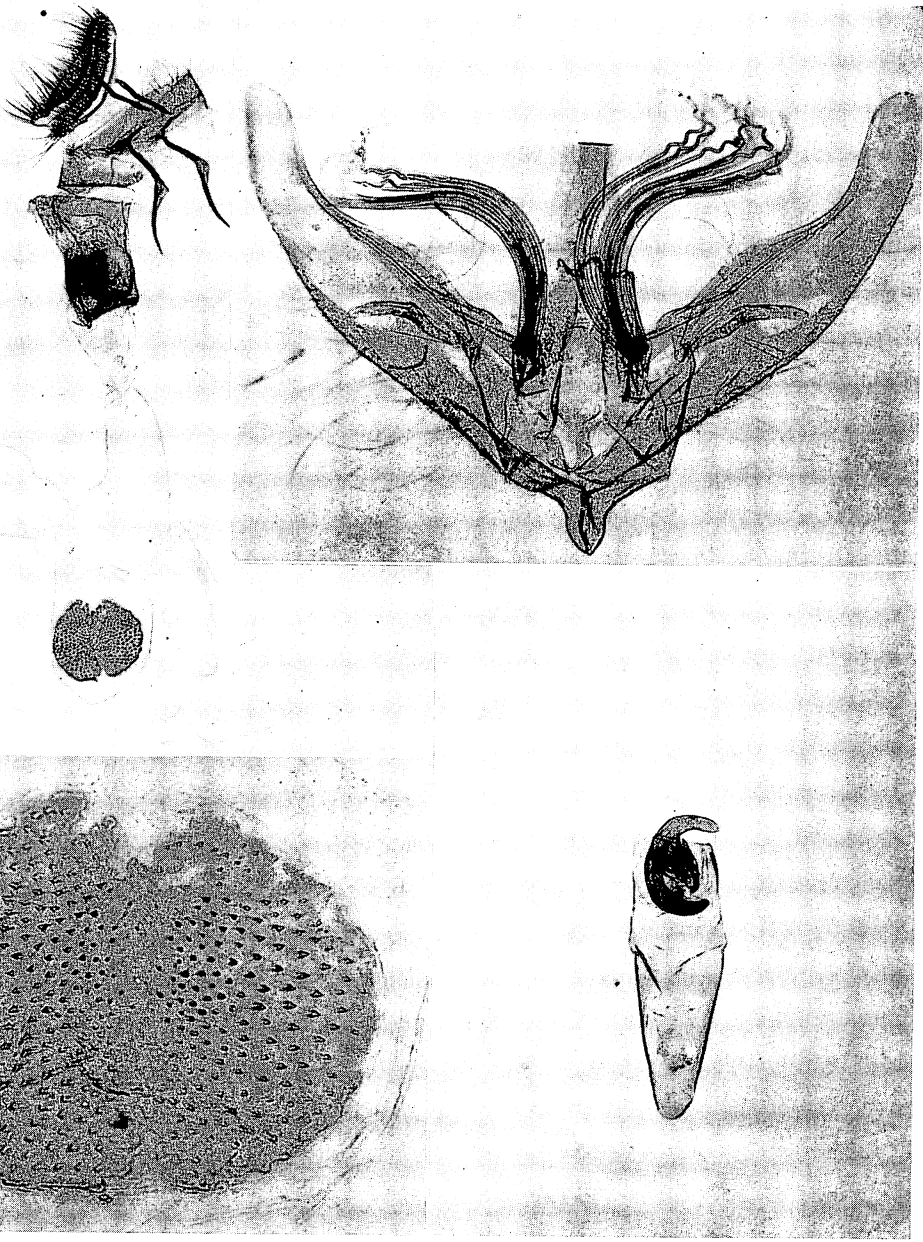


Figure 27—*Hyperectis dioctias* Meyrick, female (Kauai) and male (Lanai) genitalia.

Hyperectis bears a close external resemblance to *Tatobotys* Butler, 1880 (type *janapalis* Walker), which is distributed from Ceylon to southeastern Polynesia. I have checked the male genitalia of the genotype of *Tatobotys*, however, and find that it is quite a distinct genus. *Tatobotys vibrata* Meyrick, from the Marquesas, bears a close resemblance to our *Hyperectis*, but I have not studied its genitalia, and its correct generic status should be established.

Until this entire section can be reviewed in detail, it is necessary that our species remains in the monotypic *Hyperectis*.

Genus **TERASTIA** Guenée, 1854

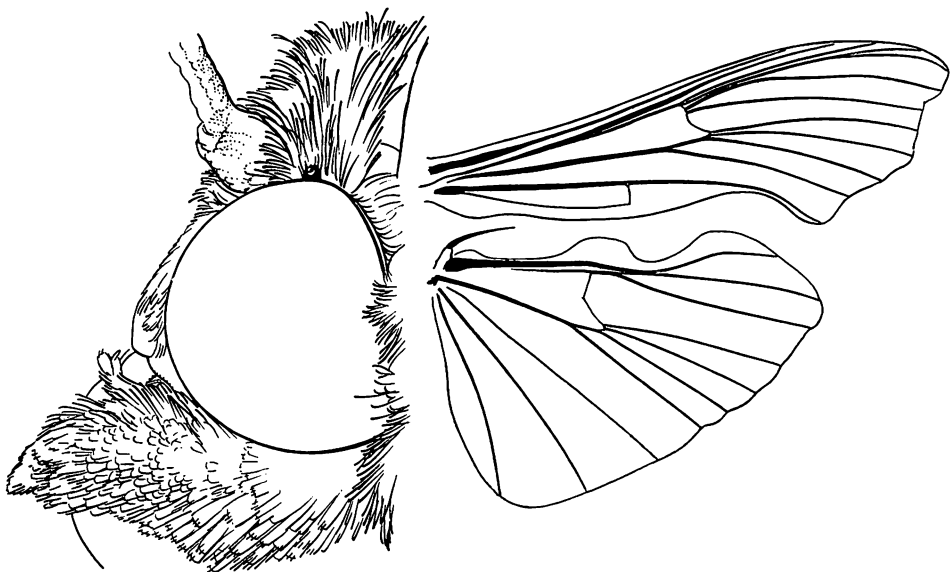


Figure 28—Head and wing venation of *Terastia meticulosalis* Guenée.

Terastia meticulosalis Guenée (figs. 28, 29, 30). Type of *Terastia*.

Terastia meticulosalis Guenée, 1854:212. Hampson, 1896:381, fig. 206. Fletcher, 1914:438, fig. 315.

Terastia sujetalis Lederer, 1863:480.

Megaphysa quadratalis Walker, 1865:1527.

Megastes coeligenalis Hulst, 1886:156.

The Erythrina twigborer.

Oahu.

Immigrant. Nearly tropicopolitan.

Hostplant: *Erythrina monosperma*.



Figure 29—*Terastia meticulosalis* Guenée, female; Jalapa, Mexico; expanse, 48 mm.; (genitalia illustrated).

Dr. Swezey (1923:297) discovered this moth feeding in the seed pods of *Erythrina*, and he thought that it might have been established in Hawaii for a considerable time before 1922. It has, however, not been recorded since, and there is reason to doubt that the species is established in our islands. It was described from Java and is well-known in India, where it is a pest of *Erythrina*. It is also found in America. In addition to feeding in the pods, it bores in the shoots.

Genus **OMPHISA** Moore, 1886:317

Omphisa anastomosalis (Guenée) (figs. 31, 32, 33). Type of *Omphisa*.

Pionea ? *Anastomosalis* Guenée, in Boisduval and Guenée, 1854:373.

Evergistis anastomosalis (Guenée), Meyrick, 1904:361. Perkins, 1913:clvii.

Omphisa anastomosalis (Guenée), Hampson, 1904:382, fig. 207. Fletcher, 1914:439, fig. 316. Fullaway, 1911:16, fig. 6, biology.

The sweetpotato vineborer.

Kauai, Niihau, Oahu.

Immigrant. This species was first collected in Hawaii by Perkins who took it in Honolulu in 1900. Meyrick (1904:361) first recorded it in Hawaiian literature. It is known from India, Ceylon, Malaya, Formosa, Java to New Guinea and other islands.

Hostplants: *Stictocardia campanulata*, sweetpotato.

Parasites: *Chelonus blackburni* Cameron, *Diocetes chilonis* Cushman, *Pristomerus hawaiiensis* Perkins.

This is a serious pest of sweetpotato. The larvae bore in the vines and tunnel in and spoil the tubers.

Swezey (1906:76) first called attention to the damage done in Hawaii by this moth. At that time he described the larva and pupa. He has recently given me

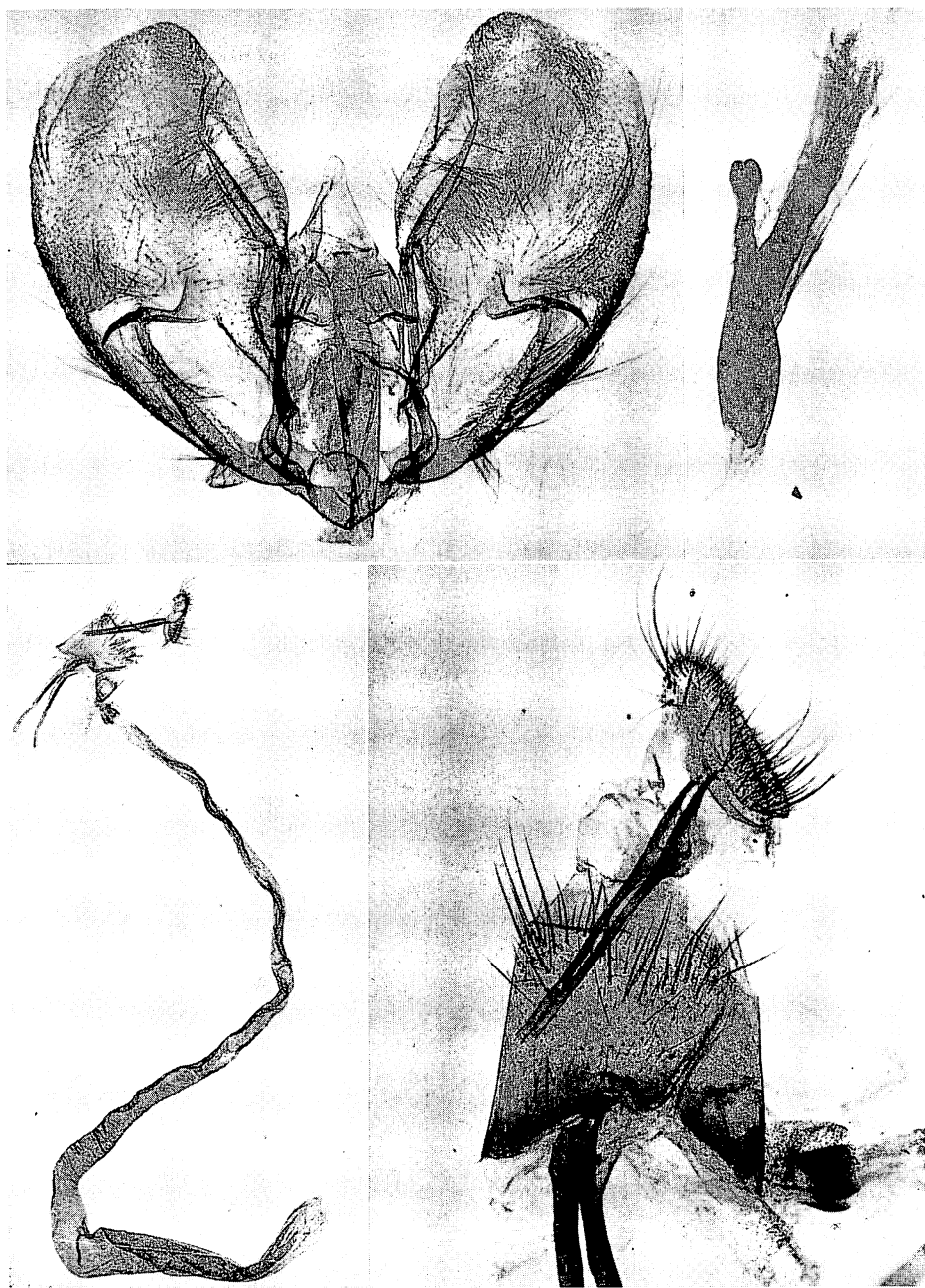


Figure 30—*Terastia meticulosalis* Guenée, male genitalia (above) and female genitalia of Mexican specimens.

some additional notes on the larva which I have incorporated as follows:

Full-grown caterpillar 25–30 mm. long; about 3.5 mm. wide, head about 2 mm.; pale yellowish white, with conspicuous brown, very broad, flat, setiferous plates; head yellowish brown, a black line on postero-lateral margin, ocelli black except the two upper and the lowest one which are white, mandibles black; prothoracic shield pale yellowish without markings; dorsal tubercles in two rows beginning with segment 3, two per segment, except segment 4; a row of tiny tubercles, one per segment, just antero-ventro to each of the anterior dorsal tubercles on segments 5 to 12; spiracles oval with dark brown plates bearing setae, the spiracles of segments 5 to 12 have a group of four tubercles surrounding each, but on some segments two of the tubercles tend to coalesce so that only three tubercles are apparent, a similar cluster of tubercles occupies the position corresponding to the spiracular position on segments 3 and 4; a line of tubercles just dorsad of the bases of the legs; four ventral tubercles on segments 5, 6, 11 and 12 (these segments without legs), and each tubercle bearing two or three hairs (most of the other tubercles bear single hairs). The pupa is about 16 mm. long and 3 mm. wide, nearly cylindrical, abruptly tapering at the two posterior segments; uniform medium brown with a slightly darker band on posterior margin of abdominal segments; tiny hairs in the places where there were hairs on the larva; wing-cases somewhat pointed, extending to posterior margin of fourth abdominal segment, and one pair of leg-cases extend a little farther, or about half-way on to the fifth segment; cremaster very short, blunt, with a few hooked spines; the pupa is formed in a slight cocoon in the larval tunnel in the vine.

Dr. Swezey described the eggs as follows: "They are very pale green, very shortly oval with a feeble reticulation on the surface, about half a millimeter in their shorter diameter, and slightly more than half a millimeter in their longer diameter. There is a sort of projection, or flange, on one side." (*Proc. Hawaiian*

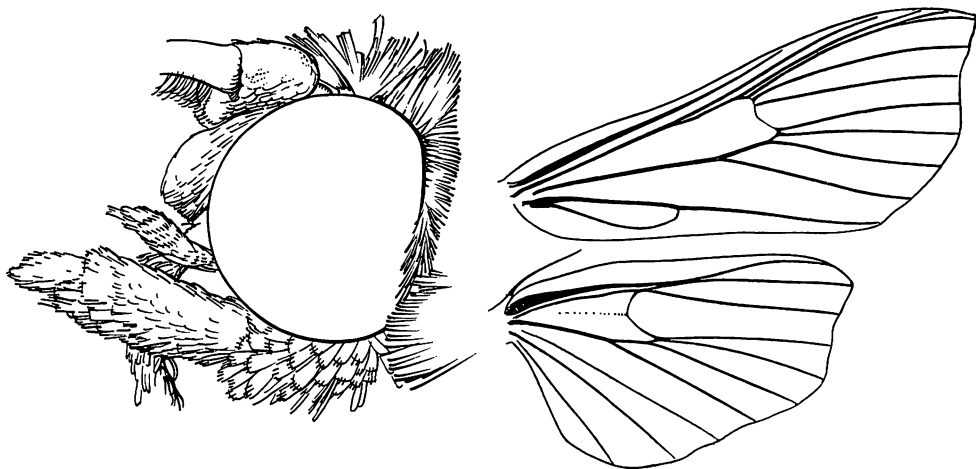


Figure 31—Head and wing venation of *Omphisa anastomosalis* (Guenée).

Ent. Soc. 12(3):474, 1946.) In 1946 (*Proc. Hawaiian Ent. Soc.* 12(3):477-478) he also reported that one female, in confinement, laid 70 eggs in one night, and that the egg stage lasted six days, the larval period 27 to 36 days, and the pupal period 12 to 16 days.

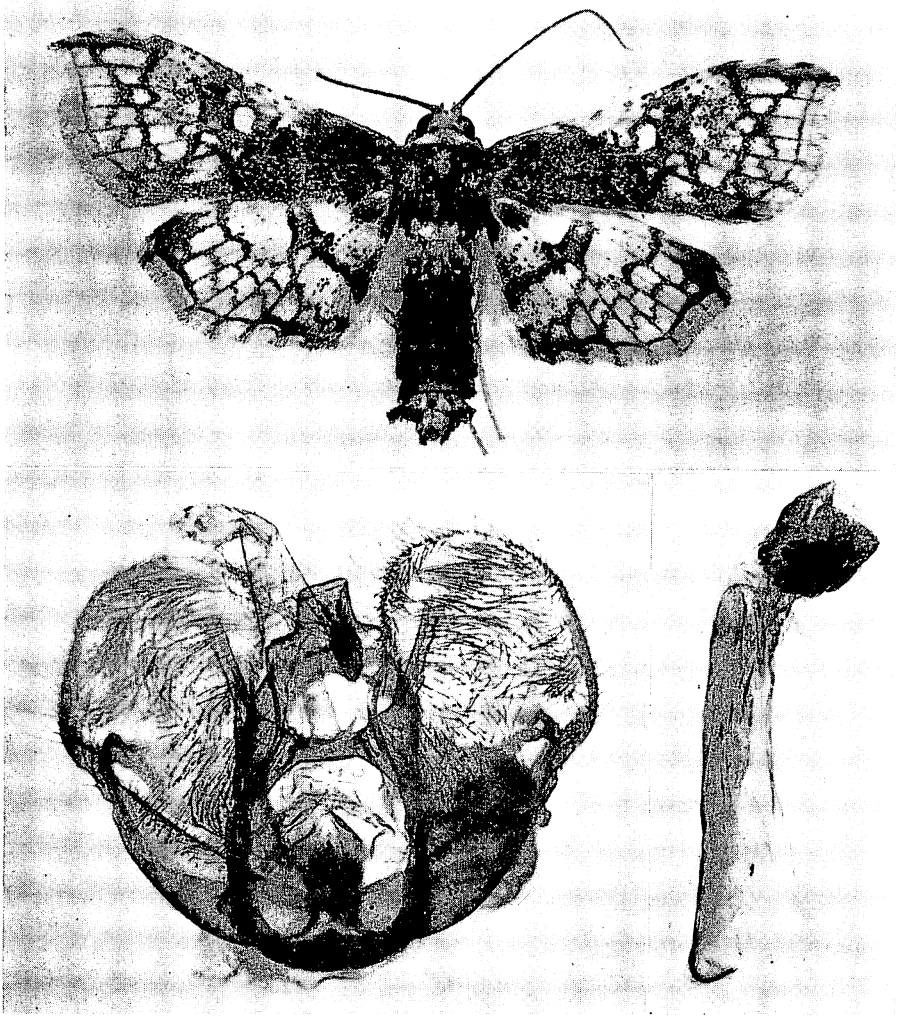


Figure 32—*Omphisa anastomosalis* (Guenée); Waipio, Oahu; right fore wing, 15 mm. long. Male genitalia of a specimen from Honolulu (below).

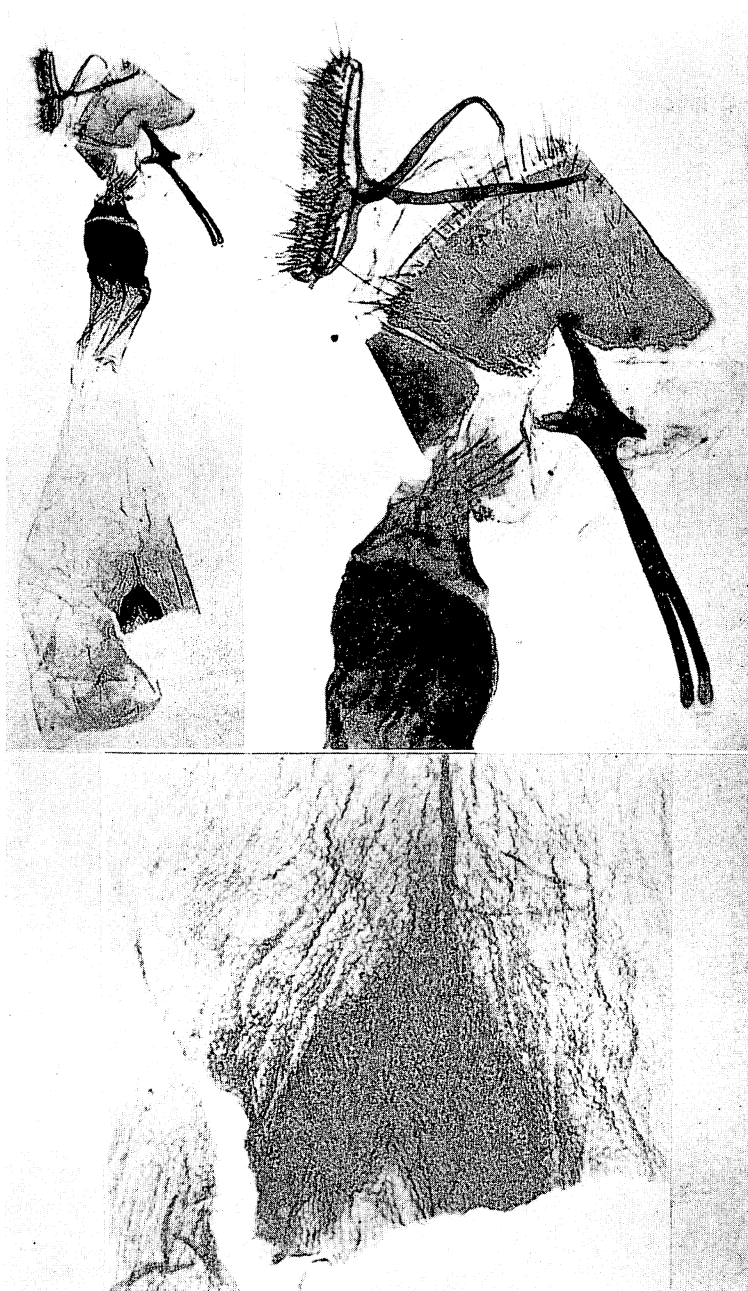


Figure 33—*Omphisa anastomosalis* (Guenée), female genitalia; Honolulu.

Genus **NOMOPHILA** Huebner, 1825

Nomophila noctuella (Denis and Schiffermueller) (figs. 34, 35, 36).

Phalaena Tinea noctuella Denis and Schiffermueller, 1775:136.

For detailed synonymy and bibliography, see Klima, 1939:380.

Kauai, Oahu, Maui, Hawaii.

Immigrant. Nearly cosmopolitan. First recorded from our islands by Meyrick (1899:227) from examples taken as early as 1892 by Perkins on Kauai, Oahu, Maui and Hawaii.

Hostplants: Grasses.

Although this is a very common insect, especially in the grassy regions of our islands, no observations have been made upon its life history, hosts or parasites in Hawaii. R. C. Smith (1942:25) has published a detailed account of the species as it occurs in Kansas, where it is found in alfalfa fields and grasslands. Smith found that the eggs were laid in rows or masses of from 80 to 142, and when laid in rows they "suggested a miniature rope." The larvae construct shelter tubes of silk and debris at the base of the hostplant, and they spend most of the time "within these shelter tubes and were observed to cut off leaves and drag them to the shelter tubes where they fed upon them, while only their heads were exposed to view. The larvae were never taken by sweeping in the field." Smith described the larvae and illustrated eggs, larva, pupa and adult. Osborn and Knull (1939:233) say that it damages pastures.

Thompson (1946:391) lists two hymenopterous parasites on this species.

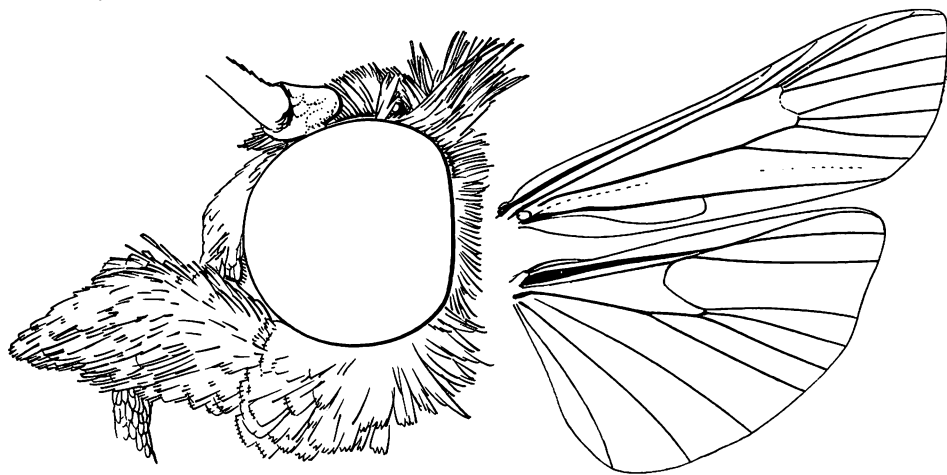


Figure 34—*Nomophila noctuella* (Denis and Schiffermueller), head and wing venation.

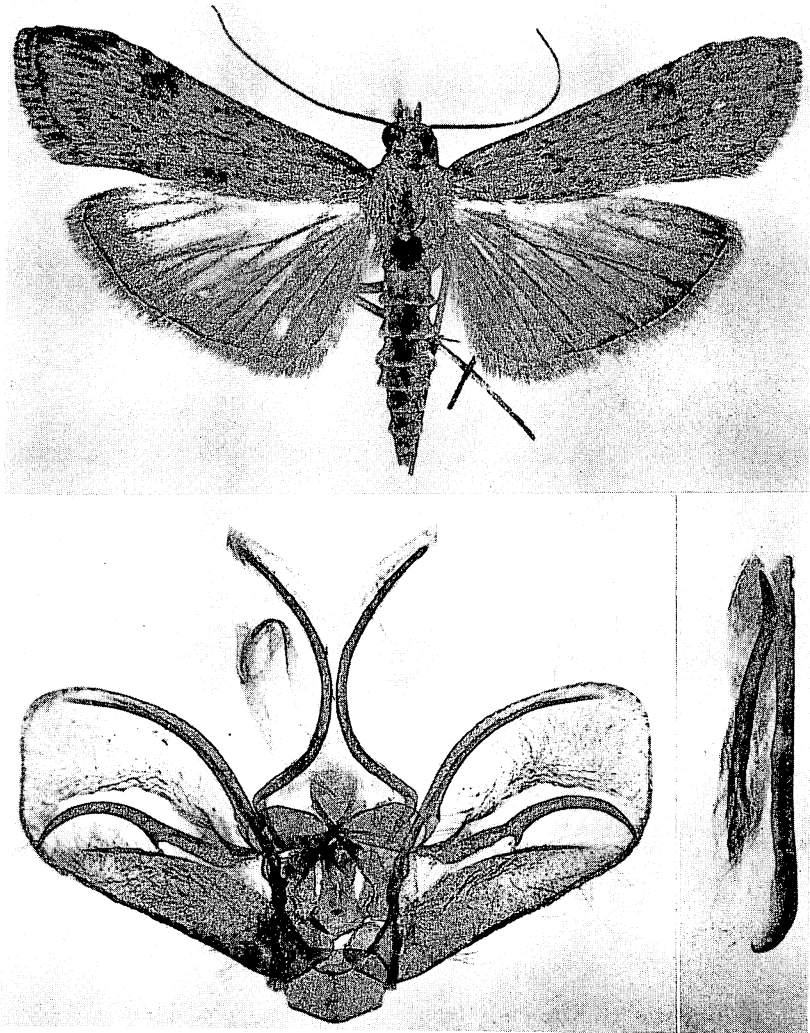


Figure 35—*Nomophila noctuella* (Denis and Schiffmueller); length of a fore wing, 13.5 mm.; Honolulu. Male genitalia of an Oahu example. The color and pattern are variable.

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Department of Entomology
Hawaii Agricultural Experiment Station
Honolulu 14, Hawaii

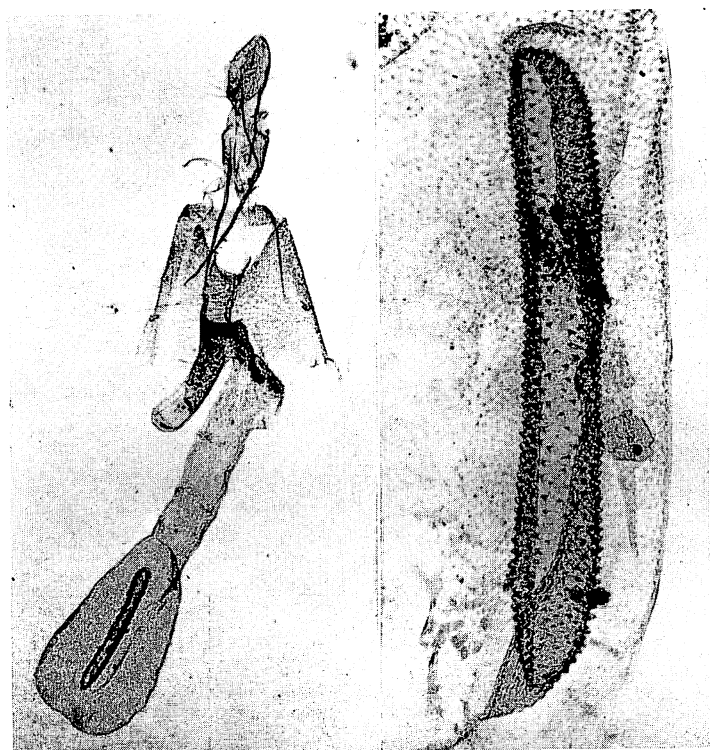


Figure 36—*Nomophila noctuella* (Denis and Schiffermueller), female genitalia (whole genitalia, India; signum, Australia).

Genus **HYMENIA** Huebner, 1825

Zinckenia Zeller, 1852.

Hymenia recurvalis (Fabricius) (figs. 37, 38, 39, 40).

Phalaena recurvalis Fabricius, 1787:222; 1794:237.

Zinckenia recurvalis (Fabricius) Zeller, 1852:55. Meyrick, 1888:217.

Phalaena Pyralis fascialis Stoll, in Cramer, 1782:236, pl. 398, fig. 0.

Hymenia exodias Meyrick, 1904:130. **New synonym.**

Hymenia fascialis, of authors, Swezey, 1907:30–32, pl. 2, fig. 12, pl. 4, figs. 9–11.

Fletcher, 1914:431, fig. 307.

The Hawaiian beet webworm.

Kauai, Oahu, Molokai, Lanai, Maui, Hawaii, Nihoa, Necker, Laysan, French Frigate Shoal.

Immigrant. A widespread species from Africa through India, China, Malaya, Australia and many Pacific islands; also in America. It was first reported from Hawaii by Butler (1877:50) from specimens collected by the Rev. Blackburn.

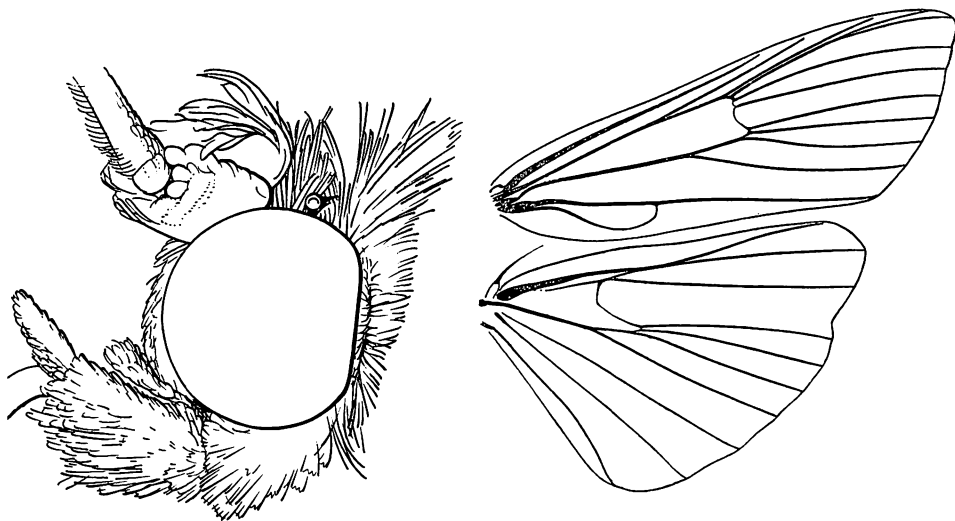


Figure 37—Head and wing venation of *Hymenia recurvalis* (Fabricius).

Hostplants: *Alternanthera sessilis*, amarantaceous weeds, *Batis maritima*, beets (common garden and sugar), chard, chenopodiaceous weeds, Chinese spinach, coxcomb, *Euxolus*, New Zealand spinach, *Nototrichium*, *Portulaca*, *Sesuvium portulacastrum*, spinach.

Parasites: *Apanteles margineventris* Cresson, *Cassinaria infesta* (Cresson), *Chaetogaedia monticola* (Bigot), *Chelonus blackburni* Cameron, *Zaleptopygus flavo-orbitalis* (Cameron), *Eucelatoria armigera* (Coquillett), *Frontina archippivora* Williston, *Pentarthron flavum* Perkins, *Trichogramma evanescens* Westwood, *Trichogramma minutum* Riley.

Predator: *Odynerus nigripennis* (Holmgren).

This is one of the most abundant of the Hawaiian Lepidoptera. Often, as one walks through weedy fields, especially during flush growth, the moths fly up in veritable swarms. The most favored food plants are amarantaceous, and at times the caterpillars become so numerous as to strip the plants. Heavy attacks are made on garden beets, and at one time a trial planting of sugar beets on Lanai was destroyed by the caterpillars.

The parasites take a heavy toll of the immature stages. *Apanteles margineventris* Cresson (introduced from Texas in 1942) has become a principal parasite and may be more effective than all of the other parasites in controlling the moth.

Hymenia exodias was described by Meyrick from a single example collected by Perkins at 1,000 feet on Molokai. Since then, additional specimens have been collected on Kauai and Maui. I have examined the type in the British Museum and have studied the genitalia. It has an odd color pattern and is darker than the normal form. It is, however, a variant only, and I have reduced it to synonymy. I have seen other color forms in the series of specimens of this species examined which might also be described if one had only single examples. Another example

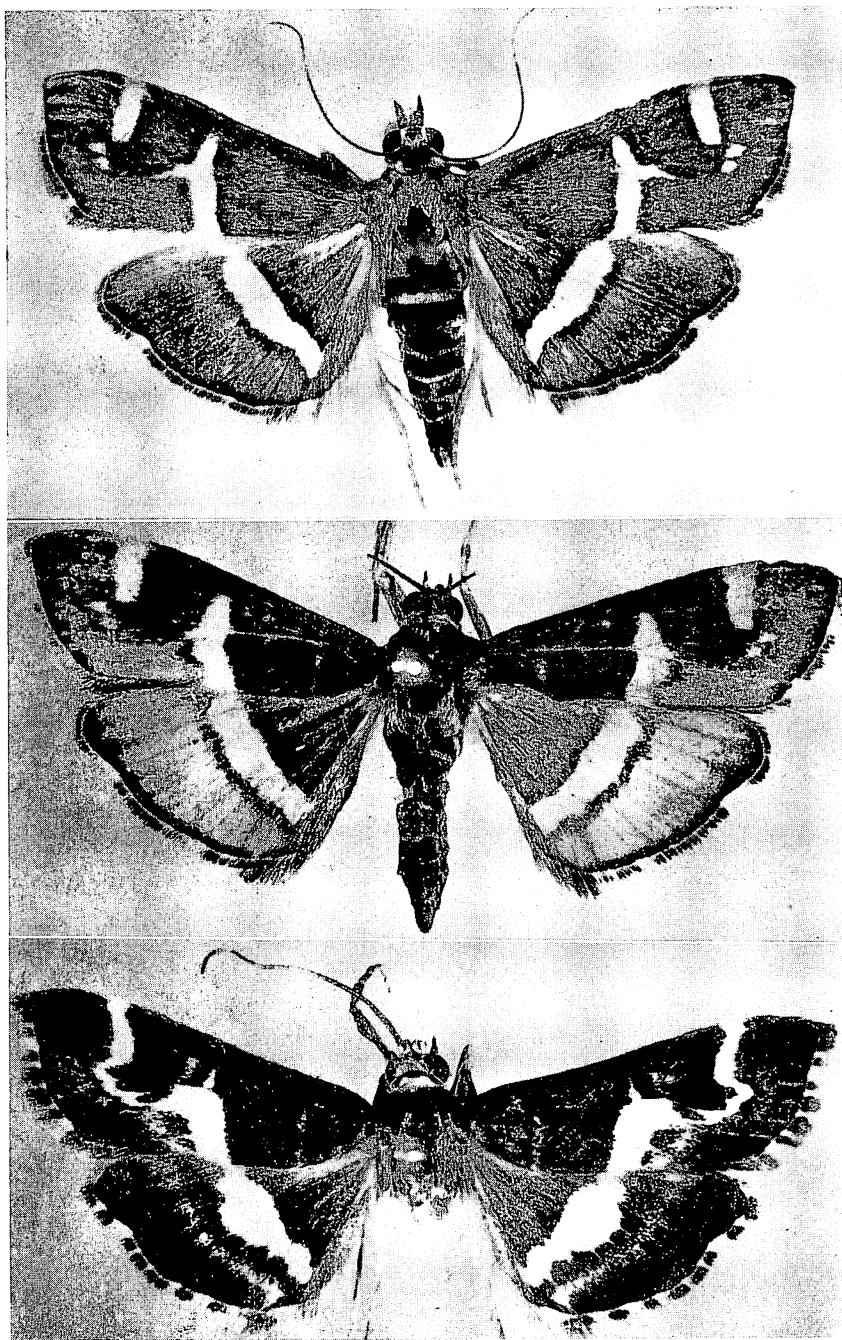


Figure 38—*Hymenia recurvalis* (Fabricius). Above: A typical color form from Honolulu; expanse, about 22 mm. Center: A color form collected by Perkins; without locality data other than "Hawaii"; expanse, 22 mm.; the broad, pale, subapical band on the hind wing is yellow. Below: The type of the dark form described as the species *exodias* Meyrick; Molokai, 1,000 feet; expanse, 23.5 mm.

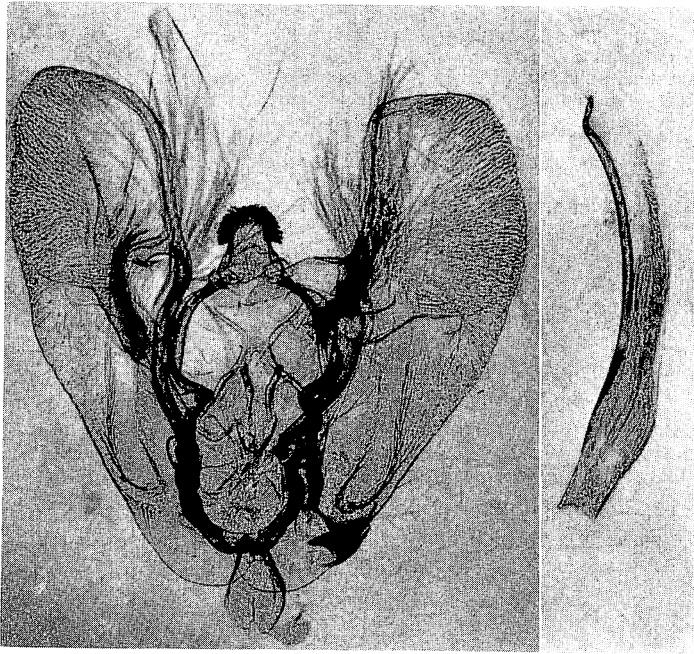


Figure 39—Male genitalia of *Hymenia recurvalis* (Fabricius), from the type of the synonym *exodias* Meyrick; Molokai.

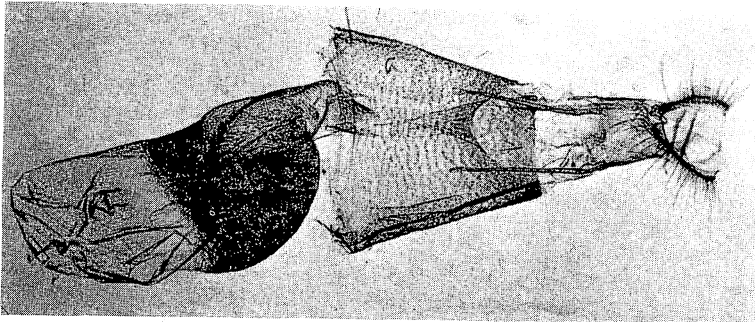


Figure 40—*Hymenia recurvalis* (Fabricius), female genitalia from an example from Tenerife.

in Perkins' collection has the hind wings pale from the white band to the margin, and one wonders why Meyrick, if he had seen it, did not describe it also. Such variations are to be expected and are not worthy of separate names.

Swezey (1907:30–32, pl. 2, fig. 12, adult; pl. 4, figs. 9, 10, larva; pl. 4, fig. 11, pupa) gave the following notes on the biology:

The caterpillars feed on the under-side of the leaves protected by a slight web; being green, they are easily hidden, somewhat resembling ribs of the leaf. The moths are often so numerous in cane-fields where . . . weeds are abundant, that they may be mistaken for cane leaf rollers, or other injurious moths.

The eggs are flattish oval about $\frac{2}{3}$ mm. by $\frac{1}{2}$ mm.; finely reticulated and somewhat wrinkled and of an iridescent greenish hue. They are deposited singly on the surface of a leaf, usually beside a rib or vein, or in a groove produced by a vein on upper surface of a leaf. They hatch in a few days, and the caterpillars are full grown in about two weeks.

Caterpillar, . . . Full-grown, 19 mm. long, tapering towards the ends, the head quite narrow compared with the middle of body; light green, turning rose-colored a day or two before spinning cocoon. The head has some faint brownish mottling, black ocelli, a tiny black dot on postero-ventral angle; cervical shield has faintly black lateral margin, a conspicuous black spot in each lateral lobe, a tiny dot behind each spot, anterior part of lateral lobe has brownish mottling similar to that on the head; two black spots on segment 3 larger than those of cervical shield, these are tubercles ii.

The pupa . . . is formed within a slight cocoon in folded together piece of leaf. It is very pale brown, 10 mm.; wing- and antenna-cases reaching to posterior margin of 4th abdominal segment; spiracles of 4th abdominal segment slightly larger and surrounded by a swollen ring; cremaster short, with 8 long hooked spines fastened into the cocoon. Pupal period about 12 days.

See H. O. Marsh (1911) for additional details and Peterson (1948:210, figs. L 55, D-F) for larva.

Genus **MARUCA** Walker, 1859

Maruca testulalis (Geyer) (figs. 41, 42, 43).

Crochiphora testulalis Geyer, 1832:12, figs. 629, 630.

Maruca testulalis (Geyer), Fletcher, 1914:440, colored pl. 36.

For extensive bibliography, see Klima, 1939:367.

The bean pod borer.

Kauai, Oahu, Molokai.

Immigrant. Nearly tropicopolitan; widespread in the Pacific. First discovered in Hawaii by Prof. Mosely in Honolulu in 1922, and first recorded in literature by Dr. Swezey in 1924 (*Proc. Hawaiian Ent. Soc.* 5(3):341).

Hostplants: *Cajanus indicus*, cowpea, garden beans, garden peas, *Gliricidia sepium*, hyacinth bean, lima beans, *Mucuna urens*, pigeon peas (also in blossoms),

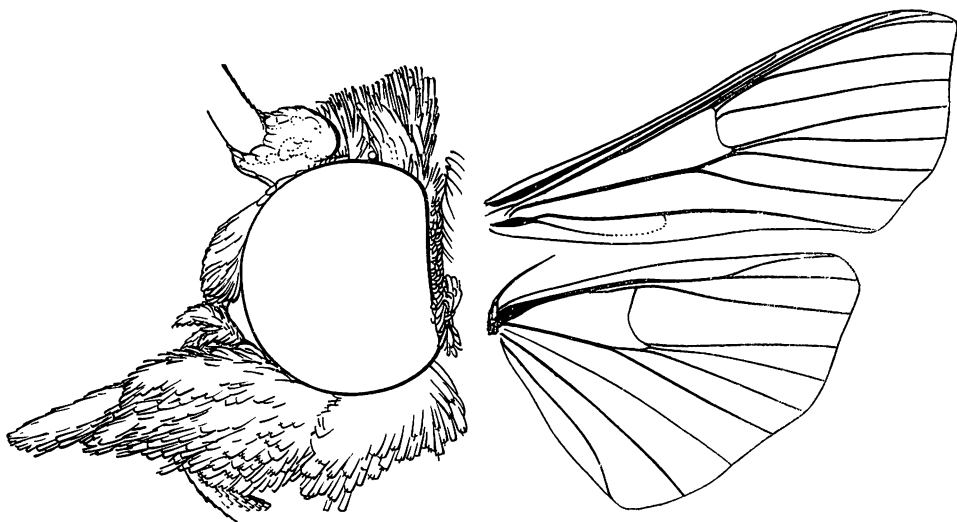


Figure 41—*Maruca testulalis* (Geyer), head and wing venation.

Sesbania grandiflora (in fresh and withered flowers), *Sesbania tomentosa* (in flowers), and probably a number of other legumes.

Parasite: *Trichogramma minutum* Riley ? Thompson (1946:372) lists several parasites.

Unlike the bean butterfly, which is commonly seen flying about the bean fields during the day, the adults of the pod borer are seldom seen. The moths which are white and brown are mainly nocturnal; they are commonly found hidden among the lower leaves of the bean plants but may be seen on the wing in the daytime during dull weather. The larvae are cream-colored with brown spots. Young larvae may feed on any of the floral parts and on the foliage but are most commonly found boring in the pods. Pods damaged early may be shed or may become deformed and unmarketable. Larger pods, when attacked, are rendered unfit for market by the unsightly holes and

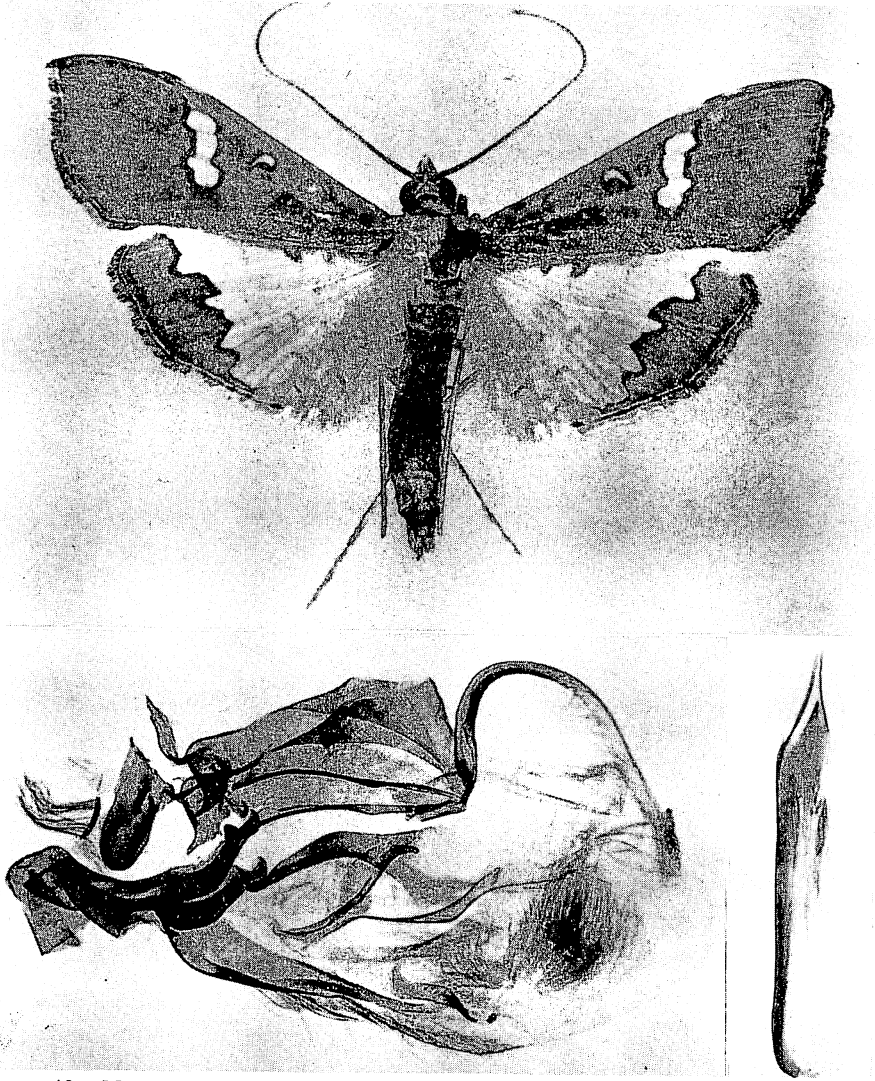


Figure 42—*Maruca testulalis* (Geyer), Honolulu; expanse, about 28 mm. Male genitalia from a specimen from Raiatea, Society Islands. Note the close resemblance of the male genitalia of *Maruca*, *Margaronia* and *Hedylepta*.

the mass of wet excrement, . . . this pod borer must be considered as one of the most destructive insects of beans in Hawaii. Much of the damage attributed to bean butterfly in the past should undoubtedly be credited to *Maruca testulalis*. Lima beans and hyacinth beans may also be heavily attacked by *M. testulalis*. Lima beans are more commonly attacked than are green beans. (Hold-away and Look, 1942:255.)

Cryolite will control the caterpillars.

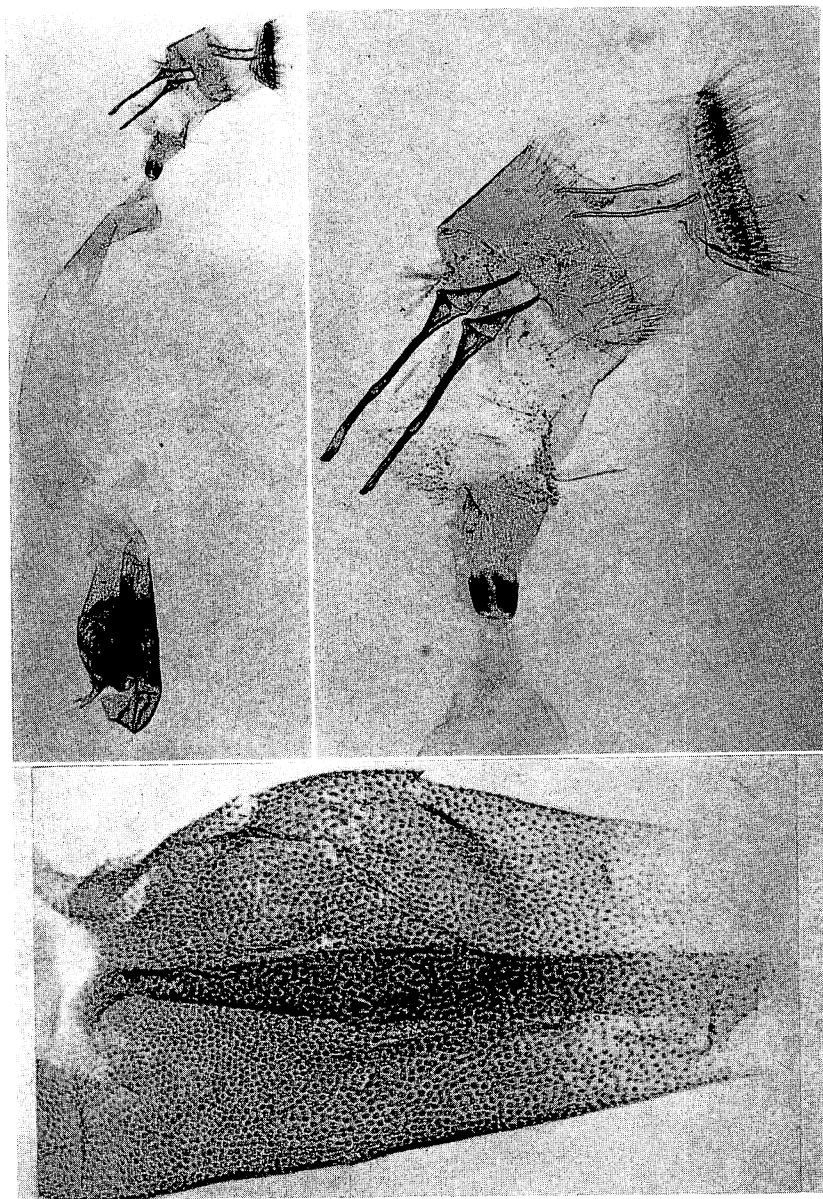


Figure 43—*Maruca testulalis* (Geyer), female genitalia from a specimen from Raiatea, Society Islands.

Genus **MARGARONIA** Huebner, 1825

Margarodes Guenée, 1854:301, not Guilding, 1829.

Hvidodes Swinhoe, 1900:499.

This is a very large genus and contains many beautiful moths. It is nearly cosmopolitan in distribution, but its greatest development is in the tropics, and the Indo-Pacific regions have an especially large number of species. As the genus is now constituted, however, I believe that it is composite. It appears to me that the two Hawaiian species may belong to two genera.

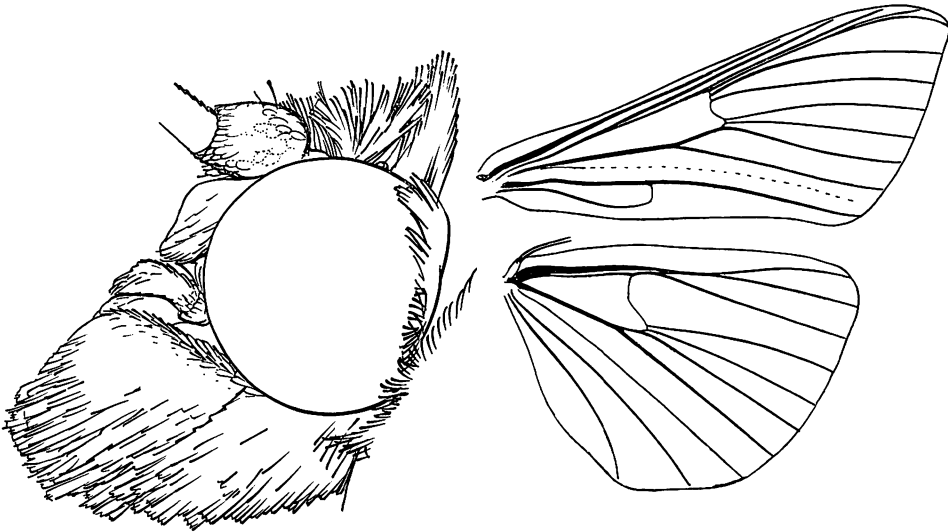


Figure 44—*Margaronia cyanomichla* Meyrick, head. *Margaronia exaula* (Meyrick), wing venation.

KEY TO THE HAWAIIAN MARGARONIA

1. Wings predominantly green.....**exaula** (Meyrick).
2. Wings whitish or pale fuscous suffused with bluish or purplish and with transverse orange or partly orange bands..
.....**cyanomichla** Meyrick.

Margaronia cyanomichla Meyrick (figs. 44, 45, 48).

Margaronia cyanomichla Meyrick, 1899:201, pl. 5, fig. 17. Swezey, 1954:174.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet), Oahu, Molokai, Hawaii.

Hostplants: Cultivated mulberry, *Pseudomorus brunoniana* (the native host).

Parasite: *Casinaria infesta* (Cresson).

In 1912 Dr. Swezey found the green caterpillar heavily attacking a mulberry tree at Hilo. Few records of this species are available. Perkins (1913:clxi) noted that it was widespread in the wetter forests, but he rarely found it except at light.

Margaronia exaula (Meyrick) (figs. 44, 46, 47).

Margaronia glauculalis, as a misidentification by Butler, 1881:327.

Margarodes exaula Meyrick, 1888:213.

Margaronia exaula (Meyrick) Meyrick, 1899:200. Perkins, 1913:clx. Swezey, 1954:180.

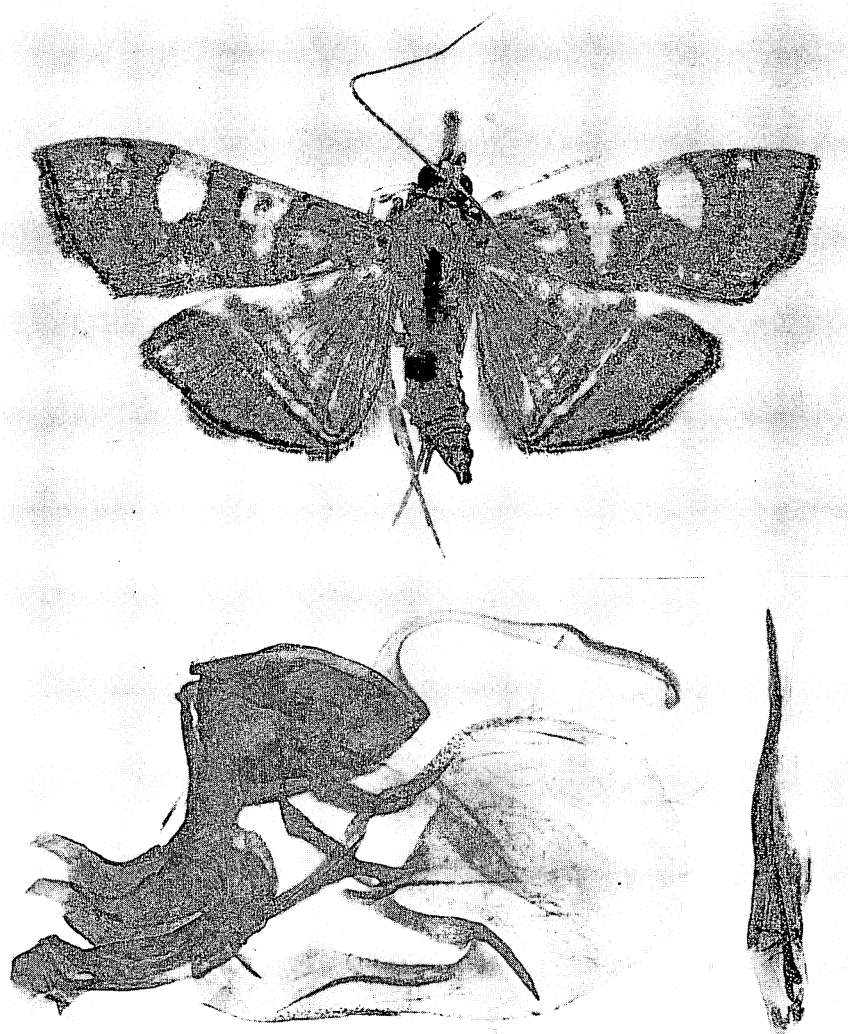


Figure 45—*Margaronia cyanomichla* Meyrick; Haleauau, Oahu; reared from *Pseudomorus*; a fore wing, 11.5 mm. long. Lateral view of male genitalia, left valve removed; from a specimen from Molokai.

Endemic. Kauai, Oahu (type locality ?), Molokai, Maui, Hawaii.

Hostplants: *Ochrosia sandwicensis*, *Rauwolfia sandwicensis*.

Dr. Perkins told me when I visited him in 1950 that his record of this species from *Euphorbia* was in error and that the tree in question was "an apocynaceous tree allied to *Ochrosia*."

This pale green moth is one of the most beautiful of the Hawaiian Lepidoptera. Dr. Swezey has told me that the larvae (which are large for Hawaiian pyralids) feed in webbed-together, younger leaves of the hostplant and pupate in the same

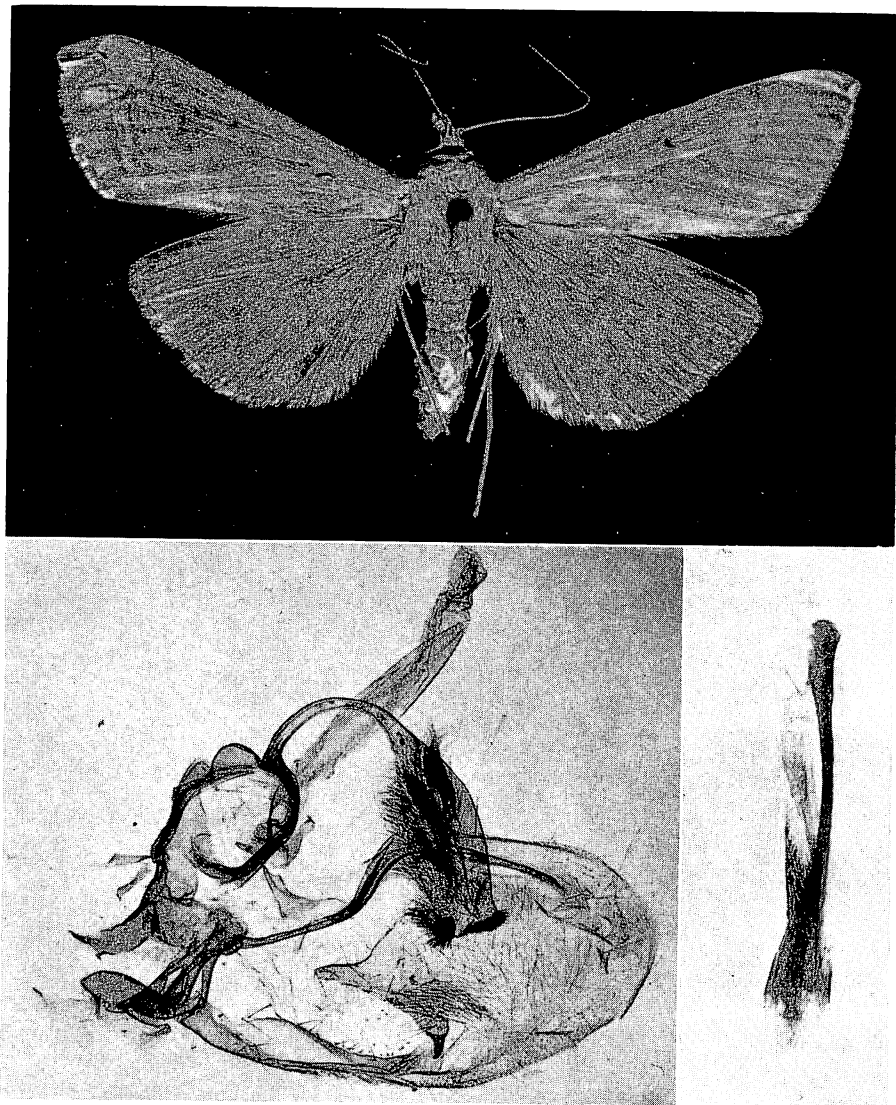


Figure 46—*Margaronia exaula* (Meyrick); length of a fore wing, 17 mm.; Waimano, Oahu. Lateral view of male genitalia, left valve removed; from an Oahu example.

place. The pupa has a wide, laterally compressed, forward projection in front of the eyes, at the front of which is a loop of the proboscis, and this will at once distinguish it from our *cyanomichla* according to Dr. Swezey.

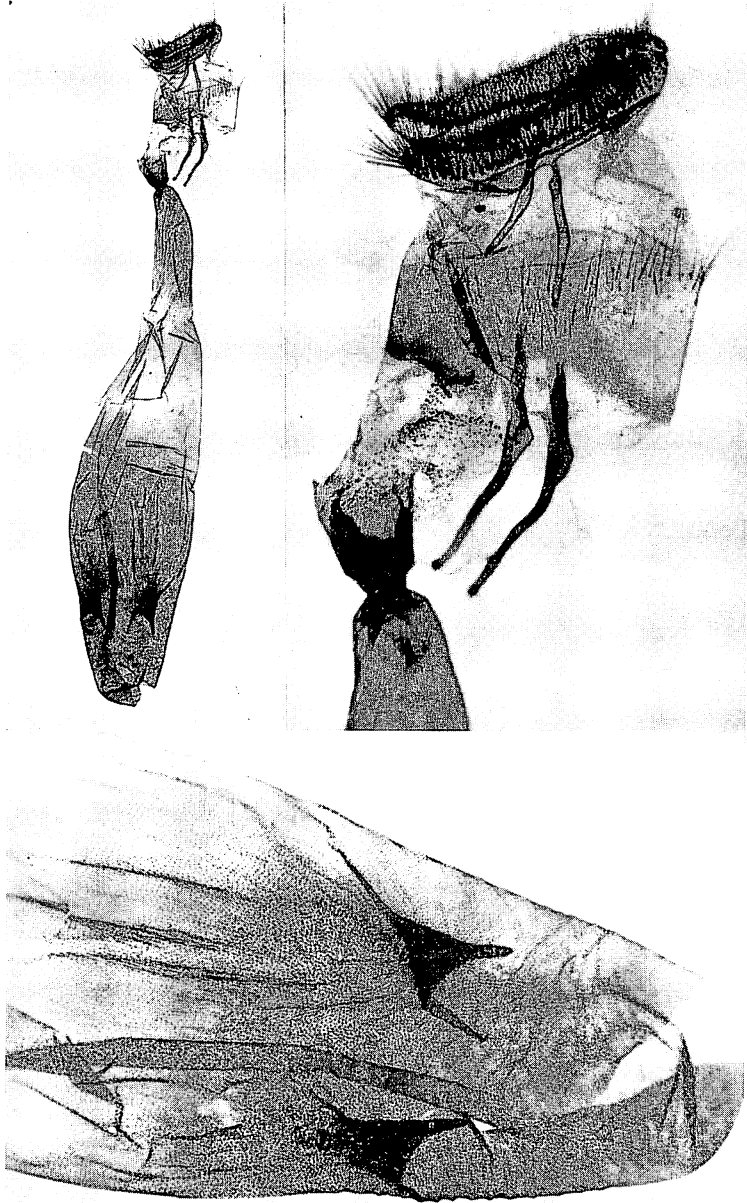


Figure 47—*Margaronia exaula* (Meyrick), female genitalia; Oahu.

Dr. Perkins (1913:liii) said “. . . the moths of the genus *Margaronia* are very different, and clearly belong to quite different groups existing outside the islands, and cannot be supposed to have developed within these from a common ancestor. One in fact (*M. exaula*) differs very slightly from foreign species, and the fact that its caterpillars are sometimes found feeding on imported shrubs growing in gardens in Honolulu renders the endemicity of the species very doubtful. It is probably an importation by man and will be found elsewhere.” I wonder if Perkins was not somewhat confused as to the species involved, because I have no record of this species being found on cultivated plants. Could he not have had in mind Swezey's record of *cyanomichla* attacking cultivated mulberry?

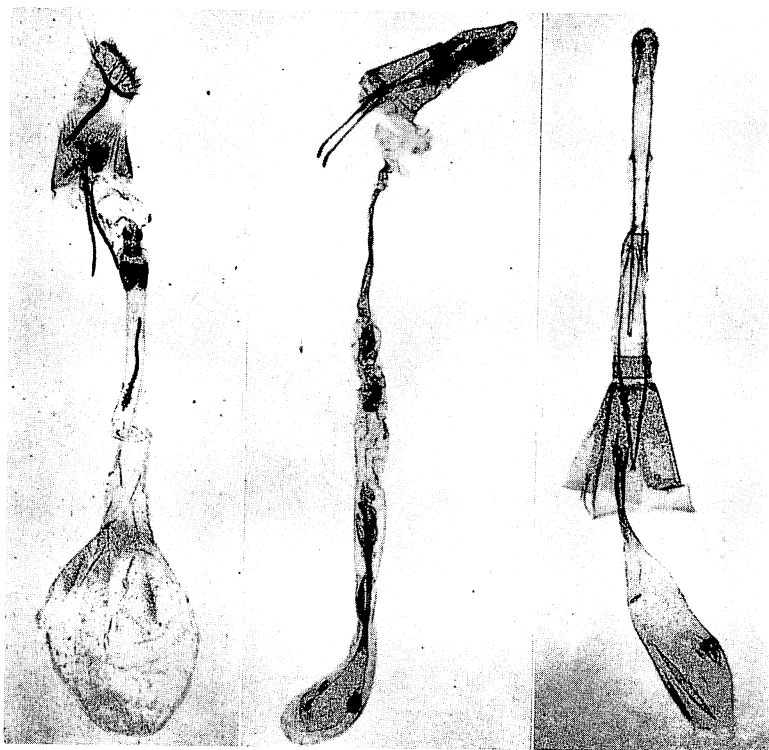


Figure 48—Female genitalia of three moths. Left: *Margaronia cyanomichla* Meyrick, Kauai. Center: *Parponyx fluctuosalis* (Zeller), Formosa. Right: *Hypsopygia mauritialis* (Boisduval).

Genus **HEDYLEPTA** Lederer, 1863:409

Loxocreon Warren, 1892:432. **New synonym.**

Omiodes, as used in Hawaii, not of Guenée. Perkins, 1913:clviii. Swezey, 1907: 1-60, pls. 1-6, monograph.

It is unfortunate to have to change the names of economic insects, but much confusion exists in the taxonomy of our moths which for many years have been well known under the name of *Omiodes*, and it is necessary to transfer them to the genus *Hedylepta*—a genus not heretofore used in any Hawaiian literature. The Hawaiian members of this genus have been placed in *Omiodes*, *Nacoleia*, *Lamprosema*, *Loxocreon*, *Salbia*, *Botys* and *Phostria* at various times by various authors. After a lengthy study of the problem, I have the following observations to make:

Hedylepta Lederer, 1863:409. Lederer included two species when he described this genus: *vulgalis* Guenée and *diemenalis* Guenée, and he placed the genus before *Omiodes*. Guenée's species *vulgalis* is a synonym of *indicata* Fabricius, and this is the type of *Hedylepta*. Although it is an Old World species, *indicata* is now nearly tropicopolitan (*vulgalis* was described from South America). *Hedylepta diemenalis* ranges from Africa through the Pacific to southeastern Polynesia. Our species agree with the type of *Hedylepta*, and they are here transferred to that genus. Small examples of the Hawaiian *monogona* are very much like *Hedylepta indicata* in pattern and appearance, but they are not as yellow as *indicata*. The similarity of the male genitalia to the type found in such genera as *Margaronia* and *Maruca*, as illustrated here, should be noted.

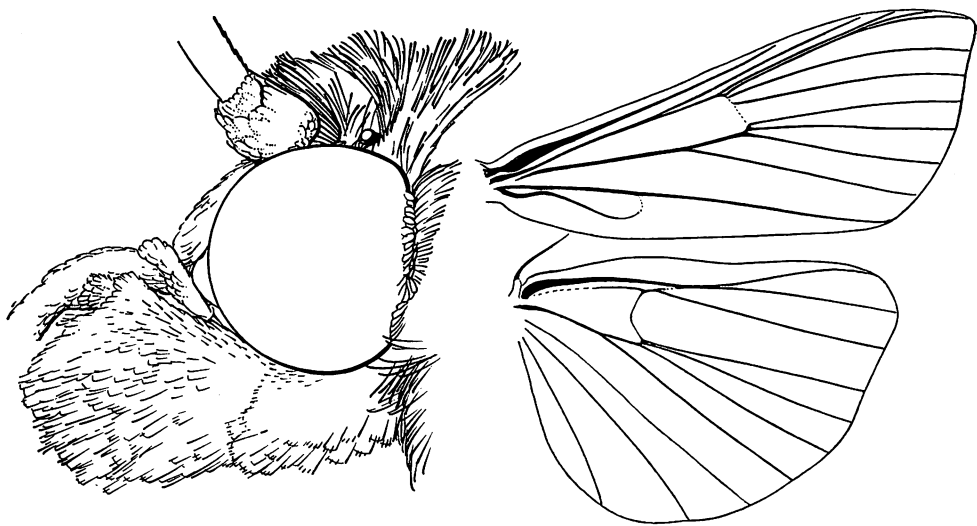


Figure 49—Head and wing venation of *Hedylepta blackburni* (Butler).

Omiodes Guenée, 1854:355. Guenée included *humeralis* (Haiti), *cuniculalis* (Cayenne), *leporalis* (Brazil) and *simialis* (Cayenne) when he described the genus. He did not cite a type for the genus, but he figured *cuniculalis* (pl. 5, fig. 9), and we might be expected to consider that the type; however, Klima (1939:122) lists *humeralis* as type of the genus. Walker (1859:118) redescribed the genus and the four original species (in the British Museum copy of Walker, *Omiodes* is marked as a synonym of *Phostria* by Hampson). Lederer (1863:118) lists *Omiodes* and cites the four original species. Druce (in *Biologia Centrali Americana*, p. 252) keeps *Omiodes* separate (including five species) from *Lamprosema*, to which he assigned only the type of that genus. Our species are not related to this South American genus.

Lamprosema Huebner, 1823:21. The type is *lunulalis* Huebner, 1823:21, figs. 303–304, the only included species. It was described from Surinam, but it is widespread from Mexico to Brazil. Our species have been included in this genus by some authors, and they were placed under that name in the *Review of Applied Entomology* between 1930 and 1934. The Hawaiian species have different genitalia and cannot be placed in this American genus.

Nacoleia Walker, 1859:934. The type of the genus is *Nacoleia murcusalis* Walker, 1859:934, from Moreton Bay and Sydney, Australia, the only included species. However, *murcusalis* is a synonym of *rhoeoalis* whose synonymy is as follows: *Nacoleia rhoeoalis* (Walker) = *Desmia* ? *rhoeoalis* Walker, 1859:933, = *Nacoleia murcusalis* Walker, 1859:934, = *Botys hypidesalis* Walker, 1859:1006, = *Samea irruptalis* Walker, 1865:1303, = *Isopteryx sordidalis* Walker, 1865:1317. In the British Museum copy of Walker, *Nacoleia* is listed as a synonym of *Lamprosema* in Hampson's handwriting. Our Hawaiian species do not belong to this genus. *Nacoleia* was used in the *Review of Applied Entomology* from 1915 to 1929, and from 1935 on for the Hawaiian species. Hampson (1918:133) erroneously listed *lunulalis* as the type of *Nacoleia*, and merged this genus with *Lamprosema*.

Semioceros Meyrick, 1884:318. This genus was erected for *Salbia amphicedalis* Walker, *Nacoleia murcusalis* Walker and *Semioceros chrysorycta* Meyrick. Meyrick said that he was not sure of his determination of *amphicedalis*. He changed Walker's name *murcusalis* to *murcalis* (Meyrick was prone to change another author's names if he did not like them). He did not cite a type for the genus. He erred in erecting a new genus to contain the type of *Nacoleia*, which we might also consider the type of *Semioceros*, but, unfortunately, Klima (1939:152) lists *amphicedalis* as type, in spite of Meyrick's note that he was not sure that he had correctly identified that species. Moore (in his *Lepidoptera of Ceylon*, p. 273) lists four species of *Nacoleia* and lists *Semioceros* as a synonym.

Phostria Huebner, 1819:130. Two species, *temira* Cramer and *tedea* Cramer, were included; no type was designated. Shibuya (1928:203) cited *tedea* as type, but Klima (1939:123) says that *temira* is type! Shibuya was wrong, because Hampson cited *temira* as type in 1918:128. Klima, in *Lepidopterorum Catalogus*, 1939, lists *Omiodes* as a synonym of *Phostria* and includes the Hawaiian species, but he was quite wrong. The Hawaiian species cannot be associated with *Phostria*.

Loxocreon Warren, 1892:432. It is strange that this genus has never come into use in Hawaii, because it would have been much more correct to have used it than to have placed our moths in the various other genera in which they have been placed by various authors. Hawaiian entomologists have overlooked Warren's work. Warren was quite correct when he said that the Hawaiian species are "certainly not *Omiodes*, as Mr. Meyrick makes them." In so far as I now know, Meyrick simply ignored Warren's conclusion. The type of *Loxocreon* is *continuatalis* (Wallengren) from Hawaii. Should the name *Hedylepta* be found unacceptable for this group, then *Loxocreon* would be available for use.

In addition to the above-mentioned genera, *Salbia* has been used incorrectly for *continuatalis*; and *accepta*, *blackburni*, *continuatalis*, *demaratalis* and *localis* have been wrongly placed in *Botys*.

Although the specific development of the group in Hawaii is distinctive, and many of the species have an appearance somewhat divergent from extra-Hawaiian *Hedylepta*, I feel that their divergence from the ancestral type is in keeping with many other genera whose endemic Hawaiian developments likewise have a characteristic appearance of their own. That is as it should be under the normal processes of evolution in isolation.

This is one of the most interesting complexes of endemic insects, and it is rich in materials for the evolutionist, geneticist and zoogeographer, as well as for the taxonomist and economic entomologist. Twenty-three species have been described, and caterpillars have been found which appear to represent undescribed species. Although much work has been done on this genus in Hawaii (because one of the species is a pest of sugarcane and another is a pest of coconut) much remains to be done, but future advance in our understanding of the complex must await more field observation, including breeding.

Two of the species of this genus break the general rule that endemic Hawaiian insects are not pests of economic importance, because *accepta* is the well-known sugarcane leafroller, and *blackburni* is the common coconut leafroller. The introductions of parasites to control these species, especially the sugarcane leafroller, have resulted in mass destruction of endemic Lepidoptera and have greatly altered the composition of the insect fauna of the islands.

The species are distributed in the Islands as follows:

	Species	Endemic to the island
Laysan.....	1.....	1
Niihau.....	1.....	0
Kauai.....	10.....	0
Oahu.....	13.....	1
Molokai.....	11.....	0
Maui.....	7.....	0
Lanai.....	4.....	0
Hawaii.....	18.....	8

The known distribution of the species is as follows:

accepta (Butler): Kauai, Oahu, Molokai, Maui, Hawaii.
anastrepta (Meyrick): Oahu, Molokai, Hawaii.
anastreptoides (Swezey): Hawaii.
antidoxa (Meyrick): Kauai, Oahu.

asaphombra (Meyrick): Kauai, Oahu, Molokai, Hawaii.
blackburni (Butler): Kauai, Oahu, Molokai, Maui, Lanai, Hawaii.
continuatalis (Wallengren): Kauai, Oahu, Molokai, Maui, Lanai, Hawaii.
demaratalis (Walker): Niihau, Kauai, Oahu, Molokai, Maui, Hawaii.
epicentra (Meyrick): Oahu.
euryprora (Meyrick): Hawaii.
fullawayi (Swezey): Hawaii.
giffardi (Swezey): Hawaii.
iridias (Meyrick): Hawaii.
laysanensis (Swezey): Laysan.
localis (Butler): Kauai, Oahu, Molokai, Maui, Lanai, Hawaii.
maia (Swezey): Kauai, Oahu.
meyricki (Swezey): Hawaii.
monogona (Meyrick): Kauai, Oahu, Molokai, Maui, Lanai, Hawaii.
monogramma (Meyrick): Kauai, Oahu, Molokai, Hawaii.
musicola (Swezey): Molokai, Maui.
pritchardii (Swezey): Hawaii.
scolaea (Hampson): Oahu, Molokai, Hawaii.
telegrapha (Meyrick): Hawaii.

It is unusual for the species of an endemic group of Hawaiian insects to be so widely distributed among the islands. The distribution of several of the species is wider than my records indicate, I believe. There are still new species to be found in the main islands; several species possibly occur on the Leeward Islands, but only one species (*laysanensis*) has been collected on those tiny, isolated, poorly explored islands. The species are so heavily attacked by introduced and immigrant parasites that many of them can rarely be found today, and all future studies can only be made under great handicap. Some species may now be extinct.

With the single exception of *monogona*, which is attached principally and natively to the legume *Erythrina* but which attacks some other legumes, all the species whose habits are known attack monocotyledonous plants. The caterpillars are mostly leafrollers. They usually roll the leaves together to form a tube in which to hide, or they fold over the edge of a leaf, or they feed between webbed-together leaves. A list of the species and the plants attacked follows:

On grasses, 6:	<i>accepta</i> <i>continuatalis</i> <i>demaratalis</i> <i>giffardi</i> <i>laysanensis</i> <i>localis</i>	On lilies, 3:	<i>monogramma</i> <i>iridias</i> <i>scolaea</i>
On bananas, 5:	<i>euryprora</i> <i>fullawayi</i> <i>maia</i> <i>meyricki</i> <i>musicola</i>	On palms, 2:	<i>blackburni</i> <i>pritchardii</i>
On sedges, 4:	<i>anastrepta</i> <i>anastreptoides</i> <i>antidoxa</i> <i>epicentra</i>	On <i>Joinvillea</i> (Flagelleraceae), 1:	<i>asaphombra</i>
		On legumes, 1:	<i>monogona</i>
		Unknown, 1:	<i>telegrapha</i>

In addition to these species, Swezey (1954:172) reported finding caterpillars of what appeared to be a new species feeding on *Pritchardia* on Kauai.

A most interesting problem arises in regard to the hostplant relationships. It will be noted that five species are attached to bananas. None of these banana-eaters has ever been found on any other hostplant. The banana, however, is not a native plant; it was introduced to Hawaii by the early Polynesian immigrants

who are believed to have colonized Hawaii from the Tahiti area within the last thousand years or so. There are no bananas on the islands of the deep Pacific basin which are not introduced by man. Have these Hawaiian banana-eating *Hedylepta* developed as distinct forms since the banana was introduced to Hawaii by man? If not, then why are they now entirely attached to banana? Why have they no other hostplants? The five banana-eaters form a closely knit group which includes the palm-eating *blackburni* and *pritchardii*. *Hedylepta pritchardii* feeds upon *Pritchardia* palms, and although *blackburni* is attached principally to coconut palms, it is occasionally found feeding upon *Pritchardia* and bananas. I am inclined to consider all of the banana- and palm-eaters as subspecies of *blackburni*. If we adopt such a course, it may appear more in line with the thoughts of some contemporary students of evolution. However, without further field work, I am not prepared to take the action at this writing. The larvae of some of these closely allied forms may be more distinct than the adults, and the habits of each form appear distinctive. Because the area between the antemedial and postmedial bands on the fore wings of *euryprora* is solidly dark colored, that form appears at first glance not to be closely allied to the others in the complex, but I believe that *euryprora* simply forms the extreme in the tendency toward melanism as indicated by *maia* and, to a yet lesser degree, by *musicola*. Some of these forms are difficult to distinguish as adults; *meyricki* and *blackburni* are very similar. We may consider that the *Pritchardia* palm was the original host of the stem form. The *Pritchardia* palms are now exterminated in the lowlands of the main islands, but we know from fossils and other evidence that these endemic palms grew down to the seashore at one time. Perhaps the stem form was a lowland moth attached to lowland *Pritchardia* palms, and when the coconut and bananas were introduced by the Polynesians, and the retreat of the *pritchardias* began, the stem form took more and more to feeding upon coconut and bananas until it had developed races which preferred these hostplants. Further study of the problem is desirable.

The distribution of the components of this banana-palm complex is also of interest. *Hedylepta blackburni* is wide-spread and common on all of the islands. Its wide distribution may, in part, be due to the activities of man in carrying infested coconut fronds from island to island. *Hedylepta maia* is confined to the adjacent islands of Kauai and Oahu. *Hedylepta musicola* is found only on the closely adjacent islands of Maui and Molokai. All of the other forms—*euryprora*, *fullawayi*, *meyricki* and *pritchardii*—are confined to the island of Hawaii.

The island of Hawaii is the headquarters of the genus, for 18 known species occur there, eight of which are restricted to the island. Of these eight endemics, three are on banana, one on palm, one on grass, one on sedge, one on a lily and one unknown. Of the 10 other species which are not confined to the island, four feed on grass, two on lilies, one on palm, one on sedge, one on Flagelleraceae, and one on legumes. This makes the following totals for the island: grass, 5; banana, 3; lilies, 3; palms, 2; sedge, 2; Flagelleraceae, 1; legumes, 1.

The parasite pressure against these moths has become very great because of the introduction of foreign parasites. Whereas many of the species were at one time common insects, most of them are now rare. I have records of only three species

of native parasites attacking this genus. They are the wasps *Echthromorpha fuscator* (Fabricius) and two species of *Sierola*. On the other hand, eight foreign wasps and three foreign flies are extremely active parasites, and parasitism now commonly exceeds 90 per cent. In some instances, evidently all larvae in a colony will be destroyed by these foreign parasites. A number of species have not been seen in many years, and they may now be extinct. The larvae were captured by some of the species of endemic *Odynerus* wasps, but that natural predation was probably well balanced and no abnormal reduction in numbers was caused by *Odynerus*. However, upon the introduction of the voracious *Pheidole megacephala* ant, many of the moths which formerly were abundant within the lowland range of the ant became the prey of this overwhelming carnivore. Swezey (1954:134) said:

Collecting in the mountain forests of late years, I have seldom found the ragged feeding on wild banana leaves which formerly was so prevalent and indicated the presence of *Omiodes*. This appears to be due to the work of immigrant parasites such as *Zaleptopygus flavo-orbitalis* (Cameron) . . . and *Casinaria infesta* (Cresson) . . . , both of which I have reared from *Omiodes* caterpillars, and which first appeared in the lowland areas in 1910 and 1921, respectively. At first these parasites attacked *Hymenia recurvalis* (Fabricius), the amaranth webworm, then gradually spread to the native pyraustid caterpillars in the mountain forests, with the result that many species of native moths are now so scarce as to be almost extinct.

Unfortunately, the genitalia of these species display only slight differential characteristics.

Dr. Swezey has given me a manuscript key which he has developed and expanded from the key given by Meyrick in *Fauna Hawaiiensis* (1899:201–202). I have revised and recast the key, but I feel that it is still in need of strengthening.

KEY TO THE HAWAIIAN SPECIES OF HEDYLEPTA

(The Leeward Island *laysanensis* omitted.)

1. Veins of fore wings marked by pale lines. 2
 Veins of fore wings not marked by pale lines. 9
- 2 (1). Postmedial transverse line in fore wings with an acute
 projection distad. 3
 Postmedial line in fore wing without an acute projection
 distad. 6
- 3 (2). Ground color of fore wings not dark fuscous. 4
 Ground color of fore wings dark fuscous. 5
- 4 (3). Angulation of antemedial line in fore wing about 65
 degrees (Hawaii; on banana) **meyricki** (Swezey).
 Angulation of antemedial line in fore wing about 75
 degrees (all islands; on coconut, *Pritchardia*, banana)
 **blackburni** (Butler).
 Angulation of antemedial line in fore wing about 90
 degrees (Hawaii; on *Pritchardia*) . . . **pritchardii** (Swezey).
- 5 (3). Angulation of antemedial line in fore wing about 75
 degrees (Hawaii; on banana) **fullawayi** (Swezey).
 Angulation of antemedial line in fore wing about 85
 degrees (Kauai, Oahu; on banana) **maia** (Swezey).

- Angulation of antemedial line in fore wing about 90 degrees (Molokai, Maui; on banana).....
.....**musicola** (Swezey).
- 6(2). Antemedial line in fore wing indicated by a broken line or series of spots; submarginal band in hind wing broken up into a series of small, completely isolated dots or spots (Hawaii).....**telegrapha** (Meyrick).
Antemedial line in fore wing a continuous dark band or shade beneath the medial cell.....7
- 7(6). Postmedial line in fore wing distinctly sinuous behind (caudad of) middle (Oahu, presumably on sedges)..
.....**epicentra** (Meyrick).
Postmedial line in fore wing not sinuous behind middle, at most feebly arcuate.....8
- 8(7). Pale part of fore wings tinged with ochreous; veins prominently pale-scaled where they cross the dark area distad of antemedial line (on grasses on all islands).....**accepta** (Butler).
Pale part of fore wings pure white; veins indistinctly pale in the dark distal area beyond the antemedial line (Hawaii; on grass).....**giffardi** (Swezey).
- 9(1). Fore wings ochreous or ferrugineous.....10
Fore wings more or less fuscous.....11
- 10(9). Fore wings ochreous (all islands; on grasses).....
.....**demaratalis** (Walker).
Fore wings ferrugineous (all islands; on *Dianella*)....
.....**monogramma** (Meyrick).
- 11(9). The large dark areas on the fore wings dark umber brown.....12
Not so.....15
- 12(11). The large dark area on fore wing not distinctly bounded by postmedial line, but gradually diminishing in intensity toward termen (Oahu, Molokai, Hawaii; on *Astelina*).....**scotaea** (Hampson).
The large dark area on fore wing distinctly cut across by the distinct postmedial line.....13
- 13(12). Postmedial line of fore wing sinuous, but in no place abruptly angled or projecting angulately toward termen (Hawaii; on *Astelina*).....**iridias** (Meyrick).
Postmedial line of fore wing angled instead of rather gently sinuous.....14
- 14(13). Angulation of postmedial line in fore wing very strong, with an acute projection toward termen between veins three and four which is distinctly produced

- distad beyond the transverse anterior half of post-medial line (Hawaii; on banana) . . . **eurypora** (Meyrick).
 Angulation of postmedial line in fore wing moderate, the main angulation obtuse and hardly produced, and not produced distad of the transverse anterior half of the postmedial line (all islands; on *Joinvillea*) **asaphombra** (Meyrick).
- 15(11). Postmedial line of fore wing curved basad along posterior margin of wing to curve around and join antemedial line (all islands; on grass) **continuatalis** (Walker).
 Postmedial line in fore wing stopping abruptly at posterior margin of wing and not at all curved basad along the posterior margin 16
- 16(15). Postmedial line in fore wing nearly straight for most of its length (Kauai, Oahu; on sedges) **antidoxa** (Meyrick).
 Postmedial line in fore wing distinctly sinuous or angled . . 17
- 17(16). Anterior part of postmedial line in fore wing slightly or distinctly concave and its subcostal section tending toward, or distinctly directed toward the apex of the wing 18
 Anterior part of postmedial line in fore wing convex, thus the subcostal section is directed slightly or distinctly basad 19
- 18(17). Posterior half of postmedial line in fore wing nearly evenly arcuate and not angled; postmedial line in hind wings crenulated but not distinctly angled (Oahu, Molokai, Hawaii; on sedges) **anastrepta** (Meyrick).
 Postmedial line of fore wing distinctly angled just posterior of the middle; postmedial line in hind wing distinctly angled at about one-third from the inner margin of the wing (Hawaii; on sedges) **anastreptoides** (Swezey).
- 19(17). A very boldly marked species with the lines on both pairs of wings widely bordered by pale scales (all islands; on legumes) **monogona** (Meyrick).
 A speckled-appearing species with ground color nearly uniformly fuscous and not boldly marked, the lines not prominent (all islands; on grasses) . . **localis** (Butler).

Dr. Swezey has also developed a key to the known larvae, and he has kindly given me his manuscript to use. Unfortunately caterpillars of some of the species, although they have been found, have not been described or preserved, and it is impossible to give a key to the caterpillars of all of the species at this time. Thus,

the key omits the following species: *asaphombra*, *epicentra*, *euryprora*, *fullawayi*, *giffardi*, *laysanensis*, *pritchardii*, *telegrapha*. Furthermore, the key is based largely on color, whereas a detailed study of the chaetotaxy should be made and incorporated. For a description of the chaetotaxy as used by Swezey, see the details in the description of the larva of *Hedylepta accepta* below (p. 76).

KEY TO THE KNOWN CATERpillARS OF THE HAWAIIAN HEDYLEPTA

1. Each lobe of head with a roundish, black spot near middle in front and a black spot including most of the eye-cluster, and without any other conspicuous marks on the head 2
 Head with four or five black or dark brown spots on each lobe of the head in addition to the spots mentioned above 10
- 2 (1). Lateral lobes of prothoracic shield not black-margined . . . 3
 Lateral lobes of prothoracic shield more or less black-margined 4
- 3 (2). Head yellowish, checkered with darker yellow (on grasses and sugarcane) **accepta** (Butler).
 Head pale green, not checkered as in *accepta* (on banana) **meyricki** (Swezey).
- 4 (2). Tubercles of abdominal segments not wholly or partially black-margined 5
 Some of the tubercles of all abdominal segments more or less black-margined 7
- 5 (4). Supra-spiracular tubercles of abdominal segment 8 black-margined only on dorsal and caudal sides, especially strongly marked posteriorly (on grasses) **localis** (Butler).
 Supra-spiracular tubercles of abdominal segment 8 black-margined nearly all around, but not strongly marked posteriorly 6
- 6 (5). Tubercles "ii" of mesothorax strongly black-margined all around except on dorsal side (on *Astelia*) **iridias** (Meyrick).
 Tubercles "ii" of mesothorax strongly black-margined only cephalad and ventrad (on *Astelia*) **scotaea** (Hampson).
- 7 (4). Prothoracic shield conspicuously black-margined laterad and caudad (on grasses) . . . **demaratalis** (Walker).
 Prothoracic shield not conspicuously black-margined, only faintly black-margined laterad, but not caudad . . . 8
- 8 (7). Prothoracic shield with the two lateral black spots joined to form a conspicuous bar (on banana) **musicola** (Swezey).

- Prothoracic shield with the two lateral black spots faint or inconspicuous.....9
- 9(8). Tubercles of meso- and metathorax entirely black-margined (on *Dianella*).....**monogramma** (Meyrick).
Tubercles of meso- and metathorax not entirely black-margined (on grasses, especially *Heteropogon contortus*, "pili" grass).....**continuatalis** (Wallengren).
- 10(1). Prothoracic shield not black-margined laterad.....11
Prothoracic shield strongly black-margined laterad.....13
- 11(10). Tubercle "i" of mesothorax strongly black-marked cephalad (on sedge).....**anastrepta** (Meyrick).
Tubercle "i" of mesothorax not strongly black-marked...12
- 12(11). Head with a blackish line on margin above postero-ventral angle (on sedge).....**anastreptoides** (Swezey).
Head without such a line (on sedge)...**antidoxa** (Meyrick).
- 13(10). Side of the head without an extension dorsad of the black eye-spot (palms, especially coconut, and banana).....**blackburni** (Butler).
Side of the head with the black eye-spot extended considerably dorsad.....14
- 14(13). Upper part of head with distinct black spots (on legumes).....**monogona** (Meyrick).
Upper part of head with brownish spots arranged more or less mosaic-like (on banana).....**maia** (Swezey).

Hedylepta accepta (Butler), **new combination** (figs. 50, 51).

Botys accepta Butler, 1877:49.

Omiodes accepta (Butler) Meyrick, 1888:214; 1899:204. Swezey, 1907:6-10, pl.

1, eggs, larva, pupa, damage, adult.

Nacoleia accepta (Butler) Hampson, 1898:699.

Phostria accepta (Butler) Klima, 1939:131.

Lamprosema accepta (Butler), of authors.

The sugarcane leafroller.

Endemic. Kauai, Oahu (type locality: probably near Honolulu), Molokai, Maui, Hawaii.

Hostplants: Grasses, including *Digitaria pruriens*, *Oplismenus compositus*, Pampas grass, *Panicum nephelophilum*, *Paspalum conjugatum* (Hilo grass), *Paspalum orbiculare*, sugarcane, and the sedge *Baumea meyenii*.

Parasites: *Angitia blackburni* (Cameron), *Brachymeria obscurata* (Walker), *Casinarina infesta* (Cresson), *Chaetogaedia monticola* (Bigot), *Echthromorpha fusculator* (Fabricius), *Ephialtes hawaiiensis* (Cameron), *Eucelatoria armigera* (Coquillett), *Frontina archippivora* Williston, *Microbracon omiodivorum* (Terry), *Nesopimpla naranyae* Ashmead, *Trichogramma minutum* Riley, *Zaleptopygus flavoorbitalis* (Cameron).

Predators: *Conocephalus saltator* (Saussure), *Odynerus nigripennis* (Holmgren), *Polistes* species, *Oechalia* species, a planarian worm.

This is one of the very few endemic insects of economic importance. Its native larval habit is rolling and spinning the leaves of various forest grasses together to form a tube in which it lives. It is most abundant in the cooler uplands. When

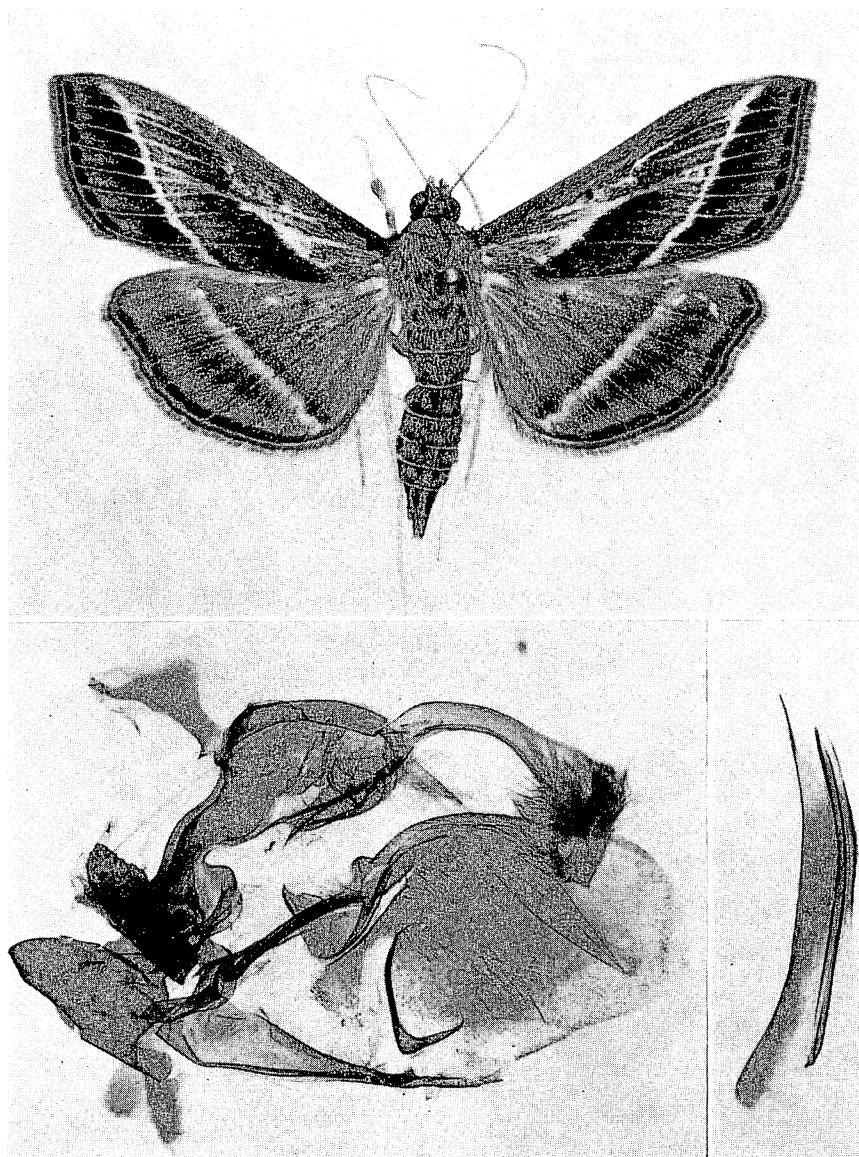


Figure 50—*Hedylepta accepta* (Butler); Ewa, Oahu; reared from sugarcane; length of a fore wing, 14 mm. Lateral view of the male genitalia of an example from Oahu, left valve removed.

sugarcane was brought to the islands, this moth added the plant to its list of food grasses. It frequently becomes a pest to sugarcane, especially in the higher, cooler fields adjacent to the native forest on the island of Hawaii, and it may become so abundant as to strip the young or half-grown cane plants. Its outbreaks are now usually quickly brought under control by the array of parasites which attack it, a number of which were purposely introduced by the Sugar Planters' Experiment Station to control this moth. The activities of the Department of Entomology of the Experiment Station, mainly under the direction of Dr. Swezey, in controlling the moth led to the assemblage of a large body of data on many native insects which might never have been accomplished had the moth not been of such economic importance to the sugar industry.

Swezey (1907:6-10, pl. 1) has given a detailed account of the species, and his details of the early stages are here quoted at length:

The eggs are deposited on the surface of a grass or cane-leaf, usually on the upper surface, in the groove of the midrib of the leaf. . . . They are in clusters of from 2 or 3 to as many as 30, and quite regularly arranged in rows, (when but a small number they are in one row) and a little overlapping like shingles. They are flat, nearly circular, about $\frac{3}{4}$ mm. in diameter, very finely reticulated on both surfaces, slightly yellowish with a slight iridescent hue which shows more distinctly after hatching. Just previous to hatching, the young larvae may be seen coiled around inside the egg. They are conspicuous by their black heads.

Freshly hatched larvae are 1.5 mm. long. They are pale greenish; head black; no markings on the other segments; tubercles and hairs conspicuous.

2nd Stage.—About 4 mm.; pale green; head with black spot at cluster of ocelli, a black dot in middle of each lobe in front; a black dot at postero-ventral angle, a black line on margin above it.

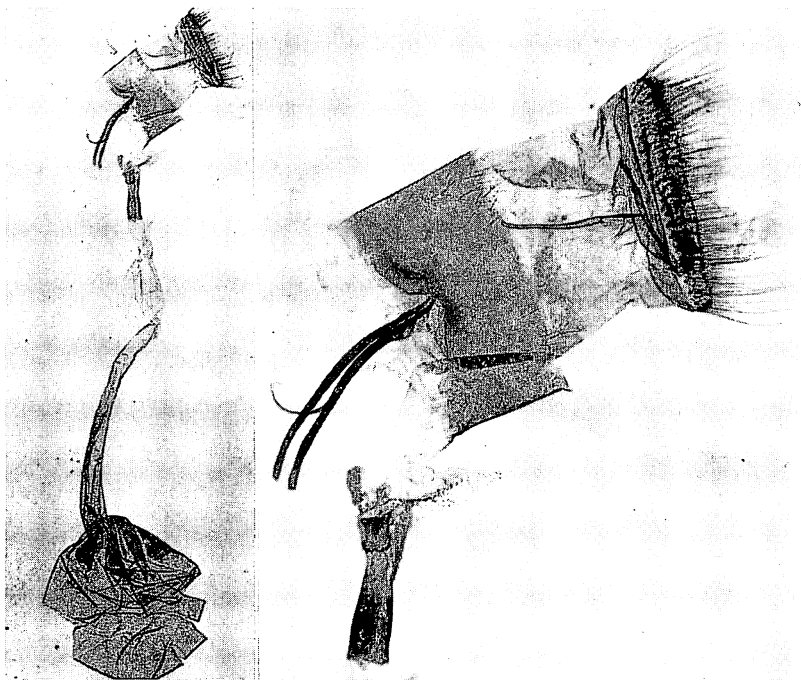


Figure 51—Female genitalia of *Hedylepta accepta* (Butler); Koolau Mts., Oahu.

3rd Stage.—About 7 mm.; pale green; head as before; a black spot in each lateral lobe of cervical shield, a black dot behind each spot; on segment 3 tubercles ii are heavily black-margined below and in front.

4th Stage.—About 12 mm.; all marks are more conspicuous; the dot and spot in each lobe of cervical shield are united; a faint oblique dash on each side above paraclypeus.

5th Stage.—About 20 mm.; the markings are the same as in the previous stage, and a faint lateral margin to the cervical shield.

6th Stage.— . . . Full-grown, 27 mm. Head rounded, slightly bilobed, pale luteus, upper part checkered with angular slightly darker spots; a rounded black spot about the middle of each half of face, two little oblique dashes a little above these and near median line, the black dot at postero-ventral angle in earlier stages is no longer present; ocelli black, except the lower posterior one; tips of mandibles black; tips of antennae brown. Body slender, cylindrical, uniform green, the dorsal vessel edged by a more or less distinct, opaque, white fat-body, the tracheae along sides show very distinctly through the integument. Tubercles broad, flat, somewhat convex, same color as body, each bearing a seta (certain ones 2 setae), arranged in several longitudinal rows; one tubercle per segment on each side of body. They are to be designated as follows: those on the dorsum are anterior trapezoidal (i) and posterior trapezoidal (ii), near the anterior and posterior margins respectively of segments 5–12 (In numbering segments, the head is 1, prothorax 2, and the others in succession), the former are nearer the median line, on segments 3 and 4 each of these tubercles is double, i.e., has two setae, and ii is situated ventrally from i, instead of posterior to it; supra-spiracular (iii) a tubercle situated just above each spiracle, also one in a nearly corresponding position on segments 3 and 4; sub-spiracular (iv + v), a double tubercle just below each spiracle, it is composed of two united and bears two setae, on segments 3 and 4 it is in front of iii, on segment 2 it is in front of the spiracle (prespiracular); lateral (vi), a tubercle a little below iv + v and situated a little farther back; marginal (vii), situated on outer side of each proleg, and on inner side of each true leg, and on legless segments a little ventral from vi, each has three setae; ventral (viii) a small tubercle near median ventral line of each segment. Cervical shield same color as body, has two black spots near each lateral margin, the anterior spot the larger, sometimes the lateral margin is faintly black. On segment 3, tubercle ii is more or less black-margined on its lower and anterior sides, making a conspicuous black spot in line with those on cervical shield. Feet same color as body; spiracles yellowish-brown, those of segments 2 and 12 larger than the others.

The recently hatched larva feeds in the folded together tip of a grass leaf which it has fastened with silk. It eats the surface of the leaf in spots, leaving the under epidermis, which gives the appearance of dead spots on the leaf . . . ; as it becomes larger it folds the leaf together lower down, doing this from time to time as it needs to enlarge its retreat, or have access to a fresh portion of leaf for feeding. In about two weeks the larva has grown to a length of 15 mm., and now eats the whole substance of the leaf, not leaving the epidermis as before. Having used up one leaf, the larva migrates to another, by spinning, rolls a portion of it into a tube. . . . within which it hides, protruding its head at the ends of the tube to feed upon the leaf; eventually its "retreat" becomes reduced by being eaten at the ends, and another leaf has to be taken, and so on, till the larva reaches its growth. Often a larva fastens several leaves together confusedly for a retreat, instead of rolling up just one.

On sugar cane the very young larvae feed in the crown of the plant where the young leaves have not yet unrolled. They are thus protected between the natural rolls of the leaf; later on they roll over the margin of a leaf forming a tube for their "retreat." When nearly full grown, they are usually found in tubes towards the tip of the upper leaves. These tubes are easily observed if the ragged leaves where the larvae have fed are examined. The work of the smaller larvae shows as oval or elongate dead spots on leaves which have unrolled in the growing of the cane after the young larvae have fed upon them.

When disturbed in its retreat, as by its being torn open, or violently shaken, or jarred, the larva wriggles very lively and drops to the ground for escape. . . .

The caterpillars are full-grown in about 3 weeks from hatching. They molt 5 times at intervals of about 3 to 5 days, and 5 to 7 days between the 5th molt and the spinning of the cocoon and pupation. Pupation takes place within a slight cocoon of white silk in the "retreat" where the caterpillar has lived; however, the cocoon is sometimes made beneath the leaf-sheaths of cane, and in other favorable places.

Pupa.— . . . Length 12–14 mm., width about 2.5 mm.; light brown, head darker; delicate hairs distributed as in the larva; cremaster somewhat flattened, blunt-pointed, with a cluster of 8 hooked spines fastened into the cocoon; spiracles slightly raised; wing-cases extending to the middle of the fourth abdominal segment, antenna- and leg-cases extending to about the middle of the sixth segment, free beyond the fourth segment.

The pupal period is 8 to 13 days, usually about 10 days.

See also, Williams (1931:144, pl. 21).

Hedylepta anastrepta (Meyrick), **new combination** (figs. 52, 53).

Omiodes anastrepta Meyrick, 1899:204; 1904:358. Swezey, 1907:14, pl. 2, fig. 7, pl. 3, fig. 5.

Nacoleia anastrepta (Meyrick) Swezey, 1915:106.

Phostria anastrepta (Meyrick) Klima, 1939:131.

Endemic. Oahu, Molokai (type locality: forest above Pelekunu), Hawaii.

Hostplant: *Carex oahuensis*.

Parasite: *Angitia blackburni* (Cameron).

Dr. Swezey told me that the caterpillars feed singly in the crown of the sedge, eating the younger leaves and spinning them together for a retreat where pupation takes place.

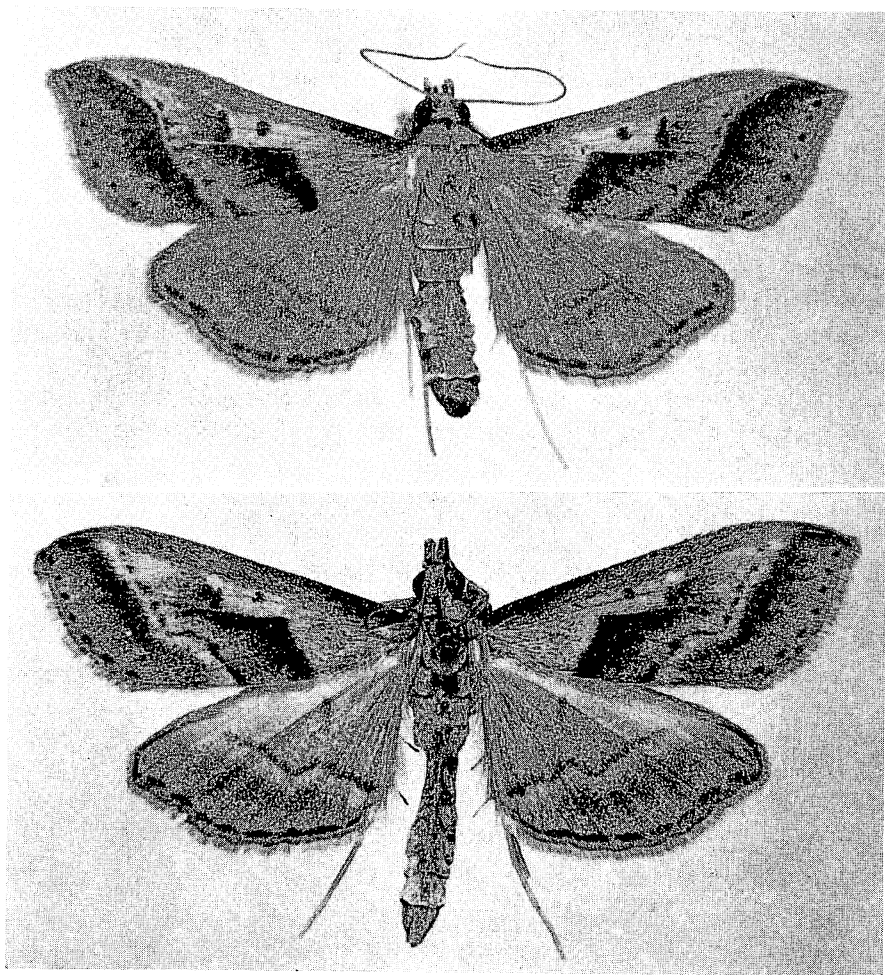


Figure 52—Above: *Hedylepta anastrepta* (Meyrick); Kilauea, Hawaii; length of a fore wing, 12 mm.; compared with the type. Below: The type of *anastreptoides* (Swezey); Waimea, Hawaii; reared from a sedge; length of a fore wing, 11.5 mm.

Caterpillar.—When full-grown, about 25 mm. long; bright green; head paler and slightly testaceous above, ocelli black; two rounded spots on face, outside of each is another, not so regular in shape, which makes a nearly horizontal row of four spots; two elongate spots extending from near the top of head obliquely downward in front nearly to the two inner spots of the horizontal row of four, above these there are often two small dots and outside of the latter on the top of the head is a black spot on each side of the head, often two or three irregular ones close together or more or less connected; sometimes there is a black bar extending obliquely outward and upward from each of the round spots in front of the face. Cervical shield without black lateral margins; two black spots in each lateral lobe, the anterior one larger and slightly elongate; two spots near anterior margin, wide apart, often a tiny dot outside of each. Segment 3 with tubercles i and ii mostly black. Often tubercles i and ii of segment 4, and i, ii and iii of segment 12 slightly marked; those of the other segments are unmarked, and less conspicuous than is usual with *Omiodes* caterpillars; tubercles i and ii of segment 3 strongly conical as compared with the others, those of segment 4 somewhat conical also.

Pupa.—About 11 mm. long; pale brownish, with greenish tinge on thoracic region; eyes nearly black; wing-cases extending to posterior part of 4th abdominal segment, the pointed apex extending one segment further and free; leg-cases and antenna-cases extending to posterior margin of 6th segment, free beyond 4th segment; cremaster short, blunt-pointed, with several hooked spines. Pupal period about 15 days. (Swezey, 1907:15, pl. 2, fig. 7, pl. 3, fig. 5.)

***Hedylepta anastreptoides* (Swezey), new combination (fig. 52).**

Omiodes anastreptoidis Swezey, 1913:272 (note typographical error).

Omiodes anastreptoides Swezey, 1915:66.

Phostria anastreptoides (Swezey) Klima, 1939:131.

Endemic. Hawaii (type locality: Waimea, Kohala Mountains).

Hostplant: sedge (*Carex oahuensis* ?).

Although the specific name was spelled originally *anastreptoidis*, Dr. Swezey always referred to it afterwards as *anastreptoides*; the "is" ending was a typographical error.

This species is closely similar to, yet distinct from *anastrepta*, which has similar habits, and it seems to be the Hawaii representative of that species which occurs on Oahu and Molokai.



Figure 53—*Hedylepta anastrepta* (Meyrick), lateral view of male genitalia, left valve removed; Molokai Mts.

Caterpillar 20–25 mm., grass green; head green, eyes black, with a dark streak extending obliquely upward from them, the usual roundish black spot in each lobe in front with a black streak extending obliquely upward and outward connected with it, a spot near suture in front, a spot between this and the frontal spot, three or four blackish spots near vertex, a blackish line on margin above postero-ventral angle; cervical shield sometimes faintly black on lateral margin, two black dots in each lateral lobe, the anterior one about thrice the size of the other; tubercle “ii” of segment 3 ventrally black-margined; tubercle “ii” of segment 12 faintly ventrally black-margined, tubercle “iii” of segment 12 dorsally black-margined most conspicuously posteriorly; spiracles yellowish.

The caterpillar has the head markings nearly like *anastrepta*, but with more black spots; and there are not such prominent markings on the tubercles. They were in spun together leaves of a small sedge. The pupa was formed in same place. Pupa 11–12 mm. long, brownish, and similar to the pupa of other species of *Omiodes*. Pupal period is 12–13 days. (Swezey, 1913:272–273.)

***Hedylepta antidoxa* (Meyrick), new combination** (figs. 54, 57, 59).

Omiodes antidoxa Meyrick, 1904:358. Swezey, 1907:16–18, pl. 2, fig. 8, pl. 3, fig. 6.

Phostria antidoxa (Meyrick) Klima, 1939:131.

Endemic. Kauai, Oahu (type locality: northwest Koolau Mountains).

Hostplants: *Carex oahuensis*, *Rhynchospora thyrsoides* (both sedges).

This species is closely allied to the other sedge-eaters, *anastrepta* and *anastrepoides*, from which it is easily distinguished by the shape of the antemedial line in the fore wing, as well as other markings.

Full-grown caterpillar.— . . . Bright green, darker along dorsal vessel; head testaceous, with the usual rounded black spot in each lobe in front, ocelli black, above the ocelli on each side of head three large irregular spots, two oblique bars near middle of top of head in front, the black dot at postero-ventral angle of younger stages is not present. Cervical shield without black margin, a black bar followed by a dot in each lateral lobe, two tiny black dots near middle in front. Tubercle ii of segment 3 faintly black-margined below, and very strongly in front, broadly conical, higher than the other tubercles. Tubercles i, ii and iii of segment 12 faintly black-margined. Among other caterpillars bred, sometimes the tubercle in front of spiracle of segment 2, tubercle i of segment 3,

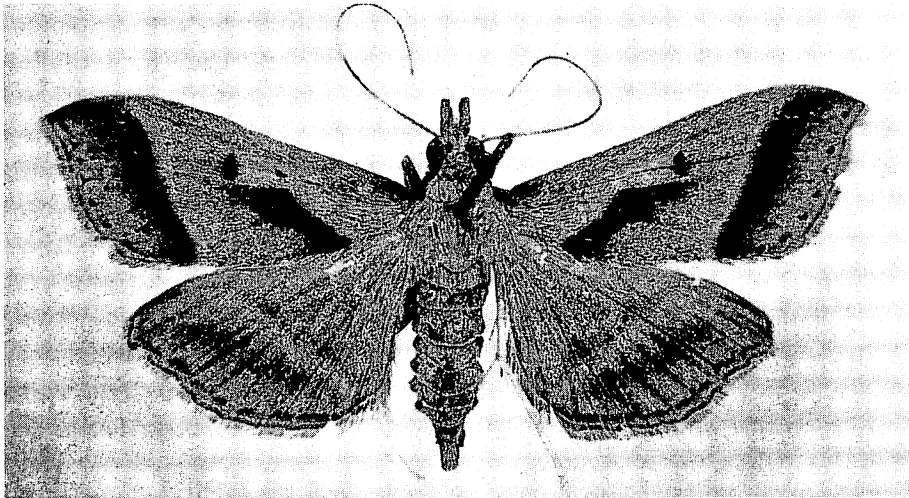


Figure 54—*Hedylepta antidoxa* (Meyrick), length of a fore wing, 11 mm.

and tubercle ii of segment 4, are faintly blackened on some part of margin. The incisures between segments are very shallow, giving the caterpillar a very smooth surface.

Pupa.—12 mm. pale brown with greenish tinge especially in thoracic region, a greener median line on dorsum of abdomen, eyes darker; wing-cases extending to apex of 4th abdominal segment, apical point a little further, antenna- and leg-cases extend a little beyond apex of 5th abdominal segment, free beyond 4th segment; cremaster short, blunt, with 8 hooked spines fastened into the cocoon. The cocoon is slight and made in the retreat where the caterpillar lived. Pupation takes place in 2 to 4 days after the cocoon is started. Larval period 20 to 22 days; pupal period 10 to 11 days. (Swezey, 1907:17-18, pl. 2, fig. 8, pl. 3, fig. 6.)

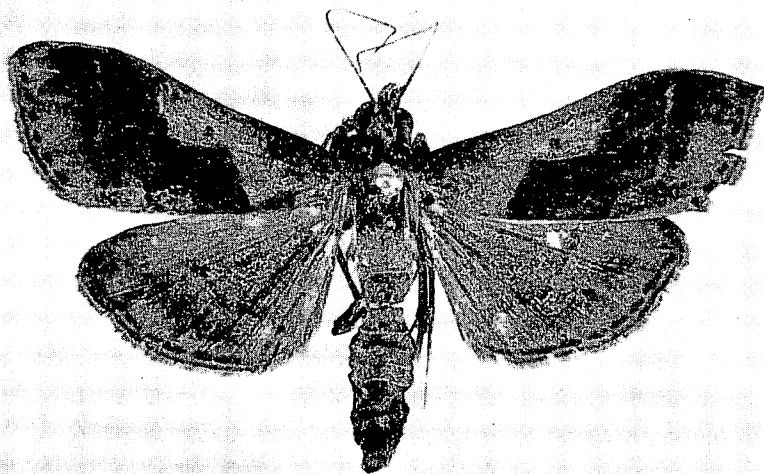
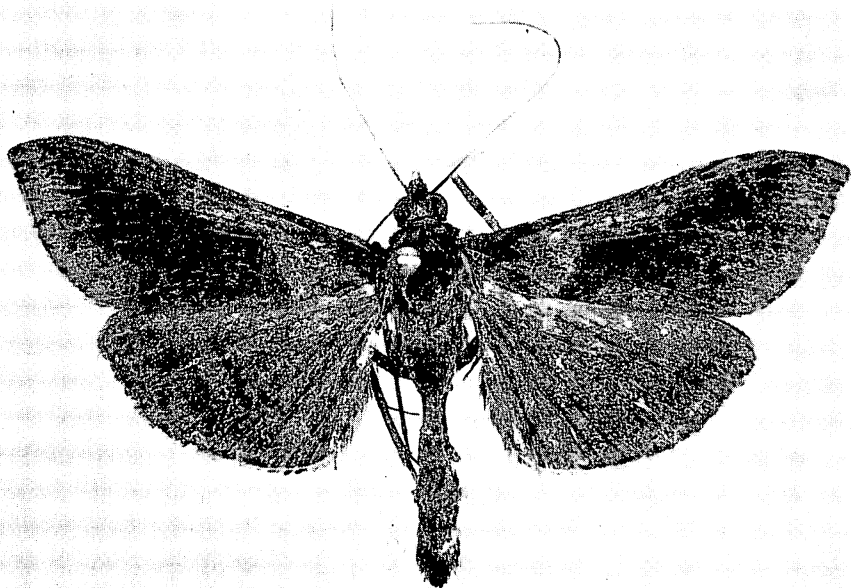


Figure 55—Above: The abraded type of *Hedylepta asaphombra* (Meyrick); Waimea Mts., Kauai, 4,000 feet; expanse, 35 mm. Below: The type of the synonym *hemiombra* (Hampson); from the same locality; expanse, 36.5 mm.

Hedylepta asaphombra (Meyrick), **new combination** (figs. 55, 57).

Omiodes asaphombra Meyrick, 1899:202. Swezey, 1907:21-22, pl. 2, fig. 5, pl. 3, fig. 1; 1954:112.

Nacoleia asaphombra (Meyrick) Swezey, 1915:106.

Phostria asaphombra (Meyrick) Klima, 1939:131.

Nacoleia hemiombra Hampson, 1912:442.

Phostria hemiombra (Hampson) Klima, 1939:132. **New synonym.**

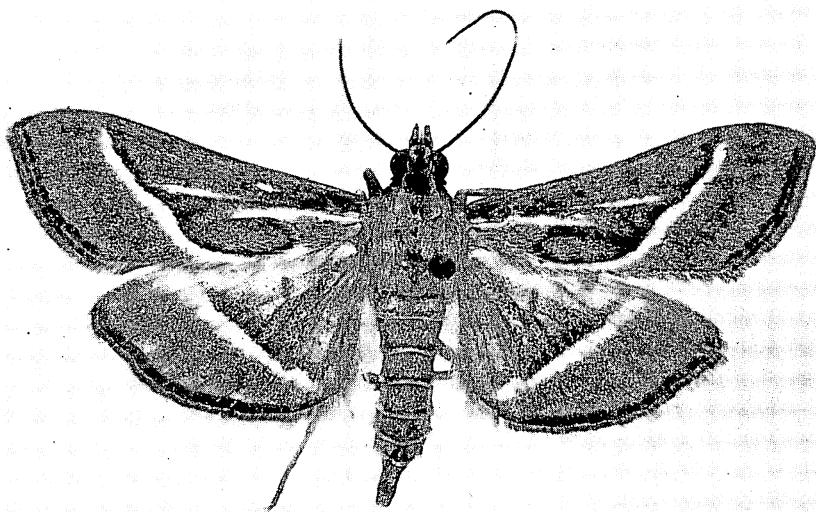
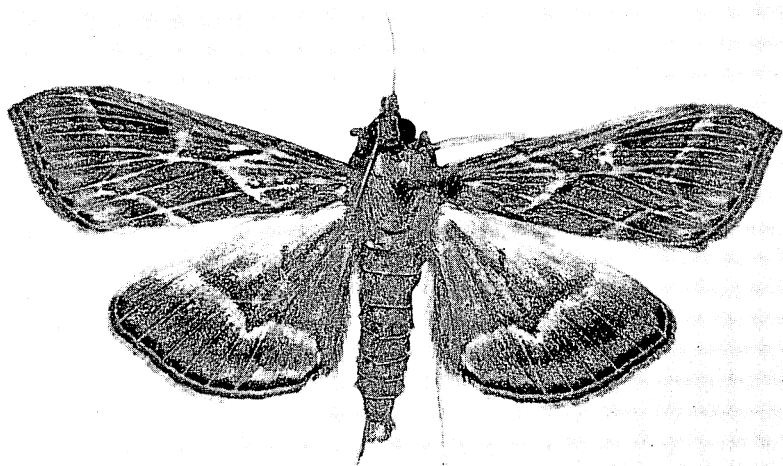


Figure 56—Above: *Hedylepta blackburni* (Butler); Waimanalo, Oahu; length of a fore wing, 16 mm.; compared with the type. Below: *Hedylepta continuatalis* (Wallengren); Leilehua, Oahu; length of a fore wing, 12.5 mm.; compared with the type.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet), Oahu, Molokai, Hawaii.

Hostplant: *Joinvillea adscendens*.

Parasites: *Angitia blackburni* (Cameron), *Casinaria infesta* (Cresson).

There has been confusion in the literature concerning the identity of this species, and some of the records assigned to it belong to *scotaea*. These include the recording of *Sierola dichroma* Perkins as a parasite, and Swezey's account in 1907.

The larvae web together the upper leaves of the hostplant and feed upon them before they become expanded.

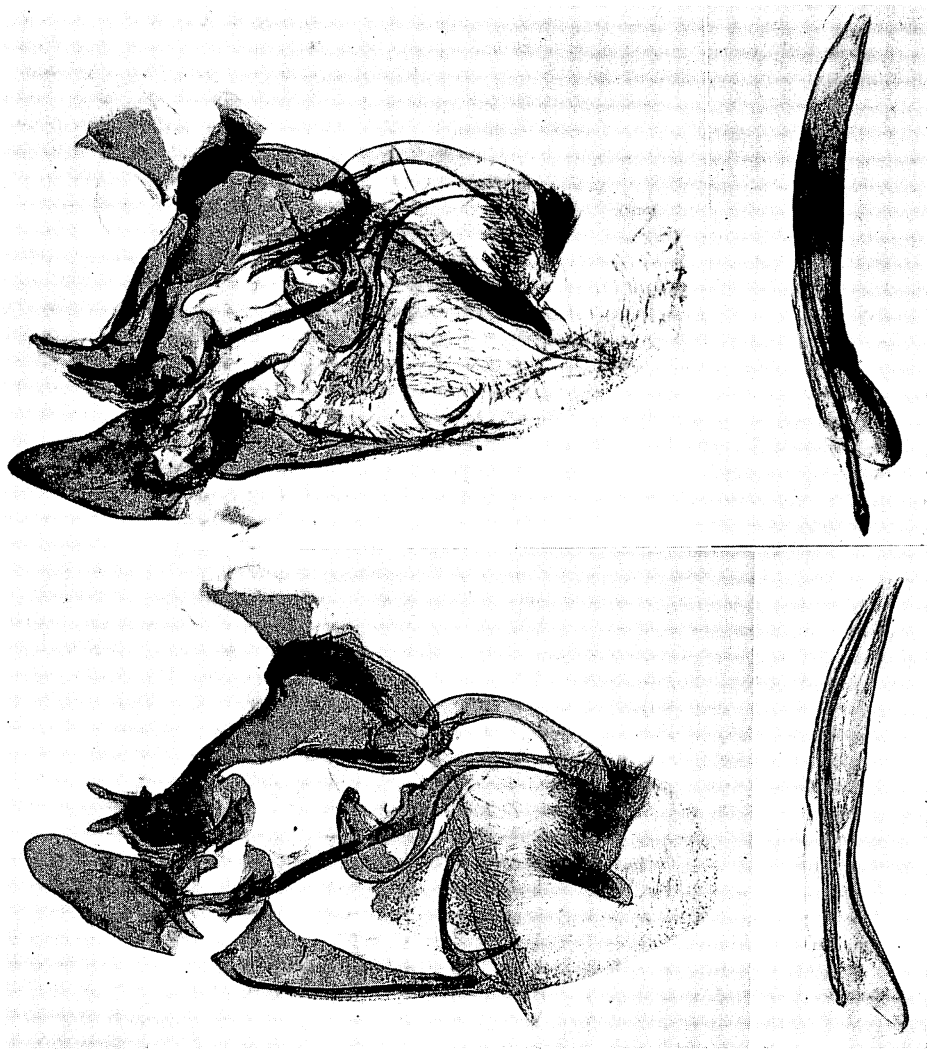


Figure 57—*Hedylepta*, lateral views of male genitalia, left valves removed. Above; *antioxa* (Meyrick); northwest Koolau Mts., Oahu. Below: *asaphombra* (Meyrick); Kauai.

Hampson's unique type of his *hemiombra* was taken with the type of *asaphombra* and does not represent a distinct species.

Hedylepta blackburni (Butler), **new combination** (figs. 49, 56, 58, 59).

Botys Blackburni Butler, 1877:48.

Omiodes blackburni (Butler) Meyrick, 1888:214; 1899:202. Swezey, 1907:22-24, pl. 2, fig. 10, pl. 4, figs. 4, 5; 1954:55, 134, fig. 22.

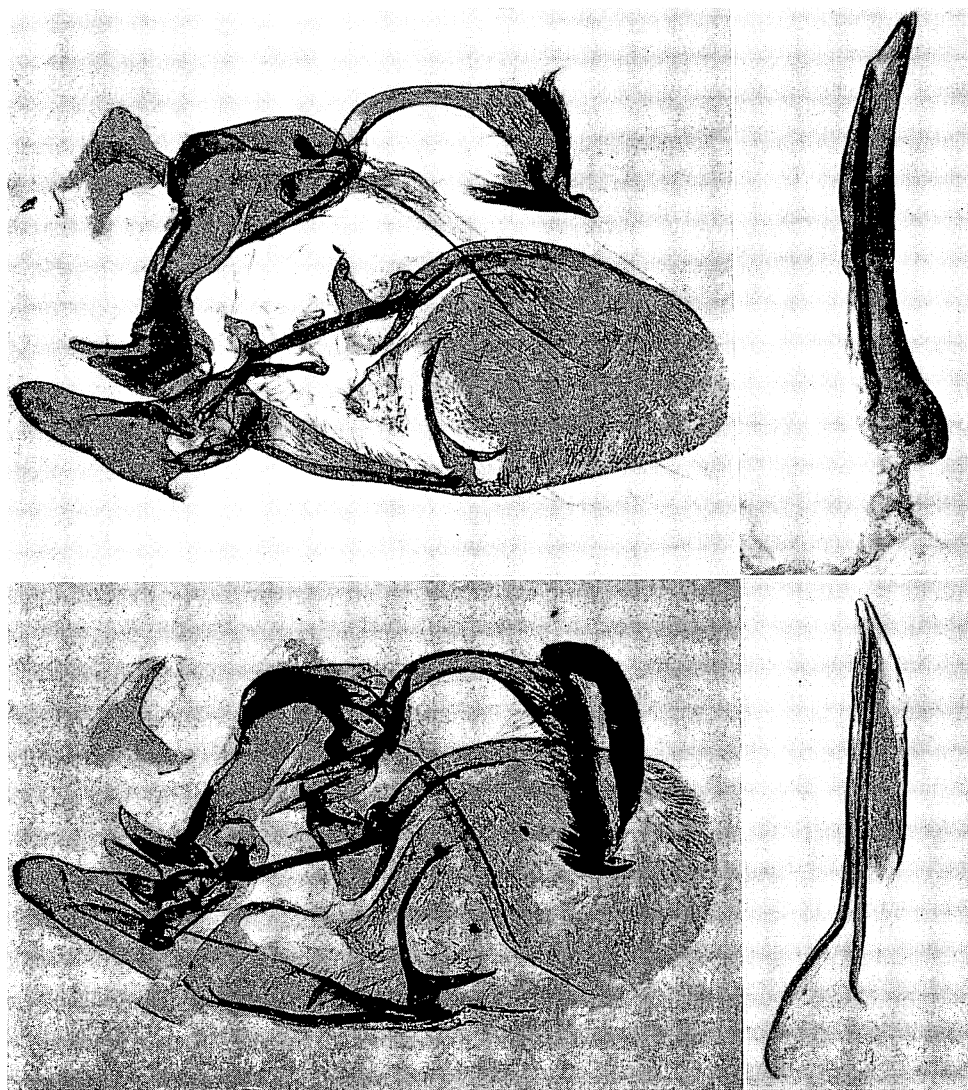


Figure 58—*Hedylepta*, lateral views of male genitalia, left valves removed. Above: *blackburni* (Butler); Honolulu. Below: *continuatalis* (Wallengren); Lanai.

Nacoleia blackburni (Butler) Hampson, 1898:699.

Lamprosema blackburni (Butler), of authors.

Phostria blackburni (Butler) Klima, 1939:131.

The coconut leafroller.

Endemic. Kauai, Oahu (type locality: the type in the British Museum bears the Blackburn code numbers "77-43"), Molokai, Maui, Lanai, Hawaii.

Hostplants: Coconut (preferred host); occasionally on *Pritchardia*, *Pritchardia pacifica*, banana, introduced "palms."

Parasites: *Angitia blackburni* (Cameron), *Brachymeria obscurata* (Walker), *Casinaria infesta* (Cresson), *Chaetogaedia monticola* (Bigot), *Echthromorpha fuscator* (Fabricius), *Ephialtes hawaiiensis* (Cameron), *Eucelatoria armigera* (Coquillett), *Frontina archippivora* Williston, *Horogenes chilonis* (Cushman), *Microbracon omiodivorum* (Terry), *Nesopimpla naranyae* Ashmead, *Trichogramma minutum* Riley, *Zaleptopygus flavo-orbitalis* (Cameron). The larvae are also attacked by a "wilt" disease.

Predators: *Pheidole megacephala* (Fabricius) eats the eggs and preys upon the larvae; *Odynerus nigripennis* (Holmgren) and *Polistes* species capture the larvae.

It appears that the original host of this species was the lowland *Pritchardia* palms, which have now been exterminated over their former ranges on the main islands. Following the introduction by the Polynesians of the coconut palm and banana to the habitat where native *Pritchardia* once grew, the moth took to the new hostplants.

The caterpillars keep the fronds of many of the coconut palms in Hawaii ragged in appearance because of their constant attack. In spite of the fact that there are a large number of parasites of this species, and *Zaleptopygus flavo-orbitalis* (Cameron) alone may parasitize over 90 per cent of the larvae, the moth persists, and its damage is widespread. The attacks vary in intensity, waxing and waning in accordance with fluctuations in the moth populations. The attacks are often especially severe in windy situations (are the parasites less effective there?). Hillebrand in his *Flora of the Hawaiian Islands* (1888:452) noted that the coconuts "have been subject to the attacks of a moth which deposits its eggs in the folds of the leaf-segments. Before the caterpillars have entered the pupal stage the young leaves are literally reduced to shreds, which gives to the trees a sad appearance and creates in the occasional visitor the impression that they live under unsuitable climatic conditions." Hillebrand's observations were made before 1870.

The following is Swezey's account of the early stages (1907:22-24, pl. 2, fig. 10, pl. 4, figs. 4, 5):

The eggs are laid in regular rows in a narrow mass by the side of a rib of the leaf or leaflet. They are much flattened, roundish, and overlap similarly to shingles. I have counted as many as 84 in one cluster, but usually a less number, about 30-50. The young larvae feed gregariously on the under side of leaf, protected by a thin web of silk. At first they eat the substance of the leaf, and leave the opposite epidermis. They soon scatter more or less, and make hiding places by fastening together the lower edges of coconut leaflets, often several caterpillars in the same place. As they become a little larger, they eat the whole substance, eating from the edge, and not leaving the epidermis. As they get the leaflet mostly eaten, they migrate to other leaflets, and where they are numerous they soon mutilate every leaflet of the leaf. The caterpillars are full-grown in about 4 weeks from hatching. They molt five times at intervals of 4 to 5 days, and a little longer period between 5th molt and time of pupation.

Freshly hatched caterpillars are whitish, about 2 mm. long; head very pale testaceous, with faint blackish dot at cluster of ocelli, and a fainter one in middle of front of each lobe. In addition to these markings, after the first molt, there is a black dot in each lateral lobe of the cervical shield; and tubercles ii of segments 3 and 4 have a black spot at lower margin.

After the second molt, in addition to above markings, the head has the markings of the full-grown caterpillar, but they are faint; and tubercles iii of segments 11 and 12 are black-margined. All of these markings become more conspicuous after third and fourth molts. After fourth molt the anterior and lateral margins of the cervical shield are somewhat blackened.

Full-grown caterpillar.— . . . Length 32–35 mm.; dull greenish, with two dorsal whitish lines, also whitish on line of spiracles. Head testaceous, a black spot including ocelli, above this a row of three irregular spots extending to vertex, often connected; a round black spot in middle of each half of face, these with one of the spots on each side of head make a horizontal row of 4; two parallel spots in middle near top of head, as viewed from in front; mandibles black at tip.

Cervical shield black-margined nearly all around, most strongly anteriorly, interrupted in middle anteriorly and posteriorly; two small dots in middle near anterior margin; two large black spots in lateral lobe of cervical shield, the anterior one larger, often connected. The tubercle in front of 1st spiracle has black dorsal margin. The dorsal and supra-spiracular tubercles of segments 3 and 4 have a black spot on their ventral margin, often lacking on dorsal tubercle of segment 4; often the tubercles of the other segments are faintly margined, especially those of segment 12. When ready to pupate the caterpillars are quite yellowish. Pupation takes place in a slight cocoon in the caterpillar's "retreat."

Pupa.—Length 15–19 mm.; light to dark brown according to age. There are two rows of delicate hairs on the back situated where there were tubercles on the caterpillar, another row just above line of spiracles, and a row below spiracles; two rows on each side of ventral median line. Cremaster quite sharply pointed, provided with 8 hooked spines which are fastened into the cocoon; wing-cases extending nearly across 4th segment, antenna- and leg-cases extending about half way across 6th segment of abdomen, free beyond 4th segment; spiracles slightly raised. Pupal period 11–13 days.

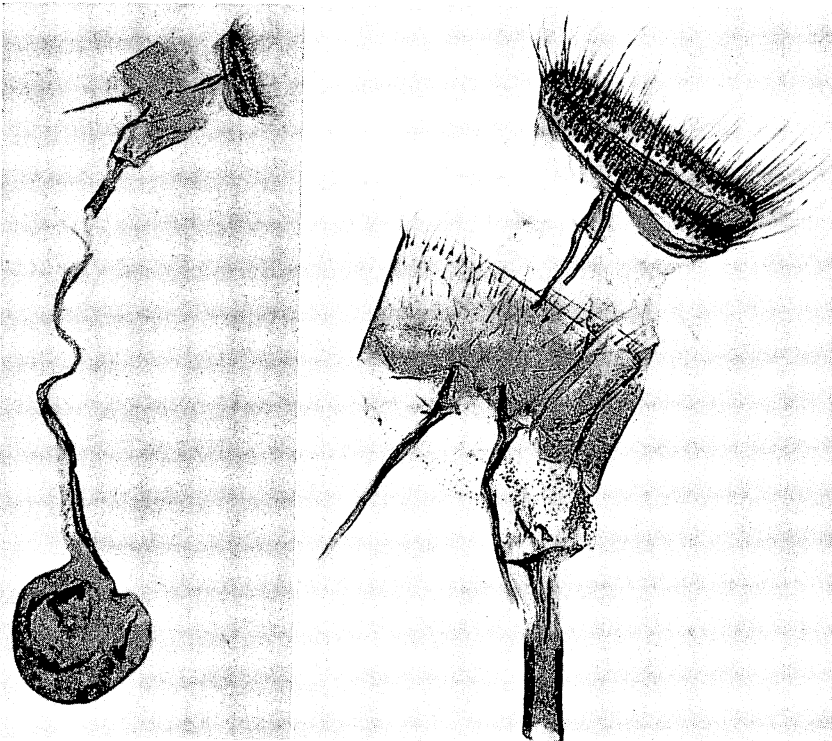


Figure 59—Female genitalia of *Hedylepta antidoxa* (Meyrick); Oahu.

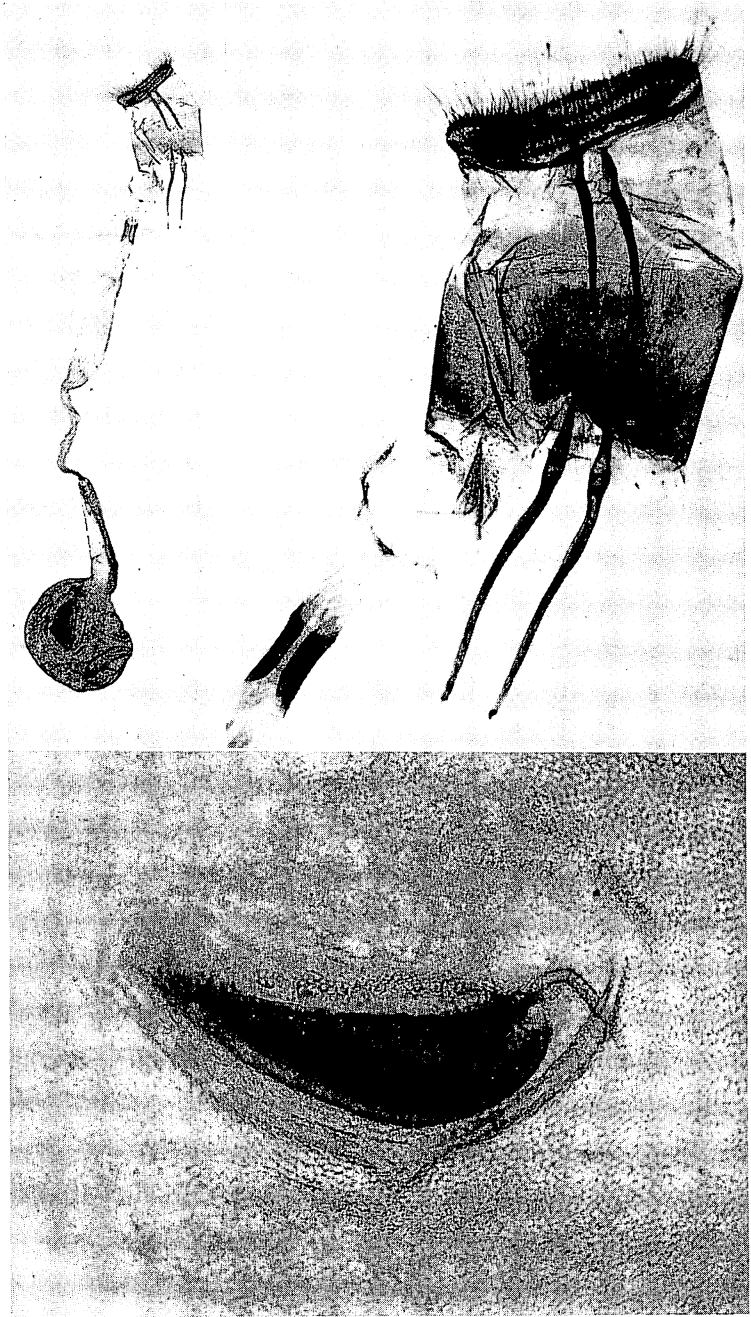


Figure 60—Female genitalia of *Hedylepta blackburni* (Butler); Oahu.

Hedylepta continuatalis (Wallengren), new combination (figs. 56, 58, 61).

Salbia continuatalis Wallengren, 1860:175.

Botys continuatalis (Wallengren) Butler, 1879:270.

Omiodes continuatalis (Wallengren) Meyrick, 1888:215; 1899:205. Swezey, 1907: 13-14, pl. 2, fig. 2, pl. 4, figs. 1-3.

Loxocreon continuatalis (Wallengren) Warren, 1892:432.

Nacoleia continentalis (Wallengren) Hampson, 1898:699 (note misspelling).

Phostria continuatalis (Wallengren) Klima, 1939:132.

Endemic. Kauai, Oahu (type locality: Honolulu), Molokai, Maui, Lanai, Hawaii.

Hostplants: *Heteropogon contortus* ("pili" grass, the principal and native host-plant), *Paspalum conjugatum*. The record of a larva having been found feeding on a sedge (Swezey, 1910:112) is evidently an error.

Parasite: *Chaetogaedia monticola* (Bigot).

Predators: *Odynerus episeustes* Holmgren, *Odynerus nigripennis* Perkins.

This species was collected during the expedition of the "Eugenie." Blackburn found it to be one of the commonest moths of Hawaii during his collecting before 1880. The moth is much less abundant now, and although I have little information regarding parasitism, I believe that observation will show that the larvae are heavily parasitized.

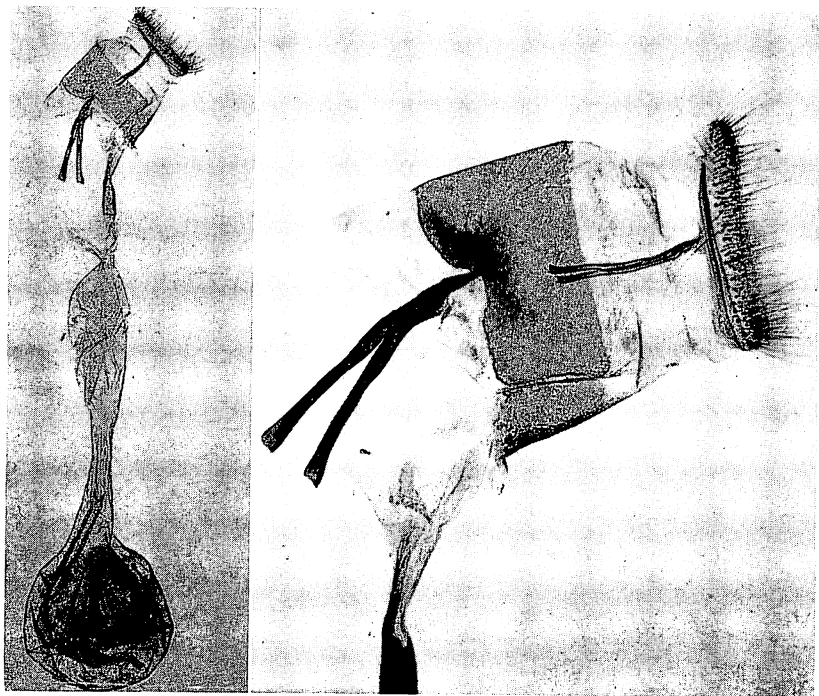


Figure 61—*Hedylepta continuatalis* (Wallengren), female genitalia; northwest Koolau Mts., Oahu.

This moth is most at home in the drier, lower slopes of the mountains where its "pili" grass host is abundant. Dr. Swezey found the larvae to be less slender than most of the other species.

The caterpillars of this species are in the habit of hiding among the mass of dead leaves at the base of the tufts of grass, and feeding on the lowermost accessible green leaves instead of feeding on upper leaves and hiding in a rolled up leaf, as several of the other species of *Omiodes* do. . . . The pupa is formed in a slight cocoon in the same place that the caterpillar had for a hiding-place. Pupal period is about 12-15 days.

Full-grown caterpillar.— . . . Length 28-30 mm.; testaceous-green, with a rosy tinge; hairs situated in black dots on the broad flat tubercles; head testaceous, two roundish black spots in front, one in middle of each lobe of face, two small blackish markings on the sutures near middle

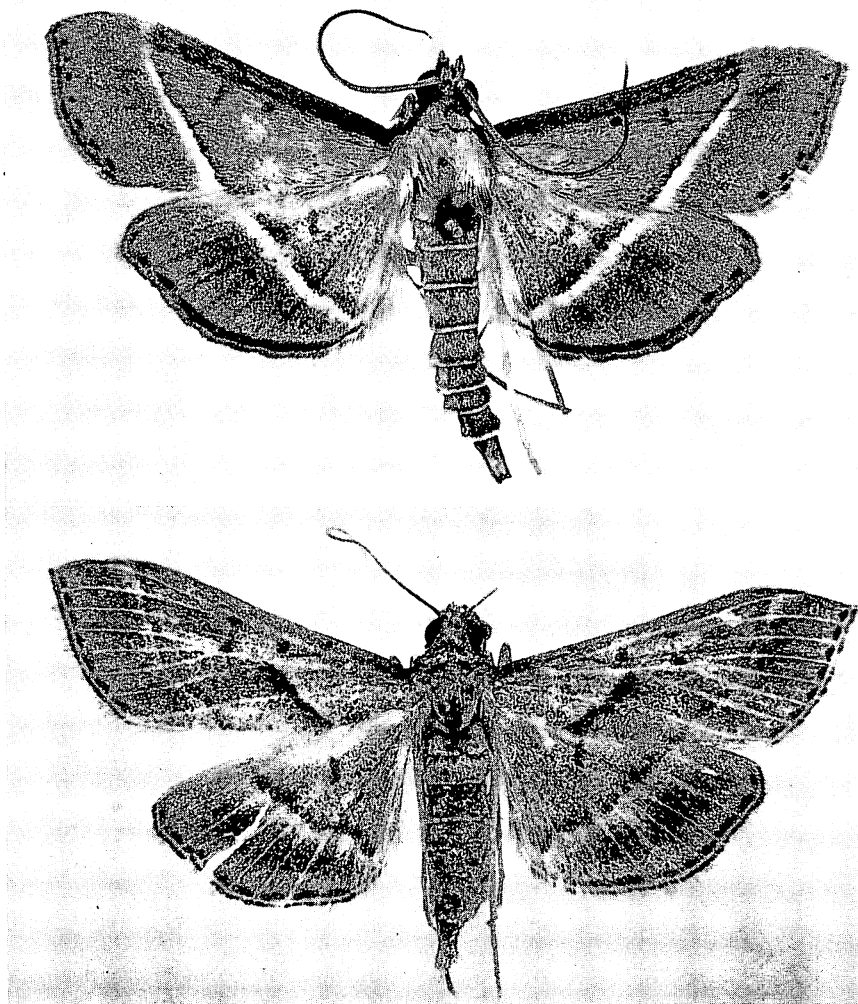


Figure 62—Above: *Hedylepta demarotalis* (Walker); Kawela Bay, Oahu; reared from *Panicum barbinode*; length of a fore wing, 10 mm.; compared with the type. Below: *epicentra* (Meyrick); no data; length of a fore wing, 10.5 mm.; compared with the type.

and a little higher up, postero-lateral margins of head slightly browned; a black spot including the ocelli, except the lower outer one; mandibles brown, black at apex. Cervical shield with two small black dots in middle near anterior margin; in each lateral lobe a large black spot and a tiny one behind it, lateral margin brown. The tubercles below the spiracles of segment 2, and all tubercles of the other segments are more or less blackish-brown margined, those of the three posterior segments most pronounced; tubercles i and ii of segment 3 often partially joined; in younger caterpillars tubercles of segments 3, 4, 11, 12 and 13 are mostly black; spiracles of segments 2 and 12 are larger than the others.

Pupa.—Length 13–15 mm.; very dark brown; hairs as usual with *Omiodes* pupae; cremaster blunt-pointed, with a cluster of hooked spines at apex; antenna- and leg-cases extending to near the posterior margin of 6th abdominal segment, free beyond the 4th segment. (Swezey, 1907:13, 14, pl. 2, fig. 2, pl. 4, figs. 1–3.)

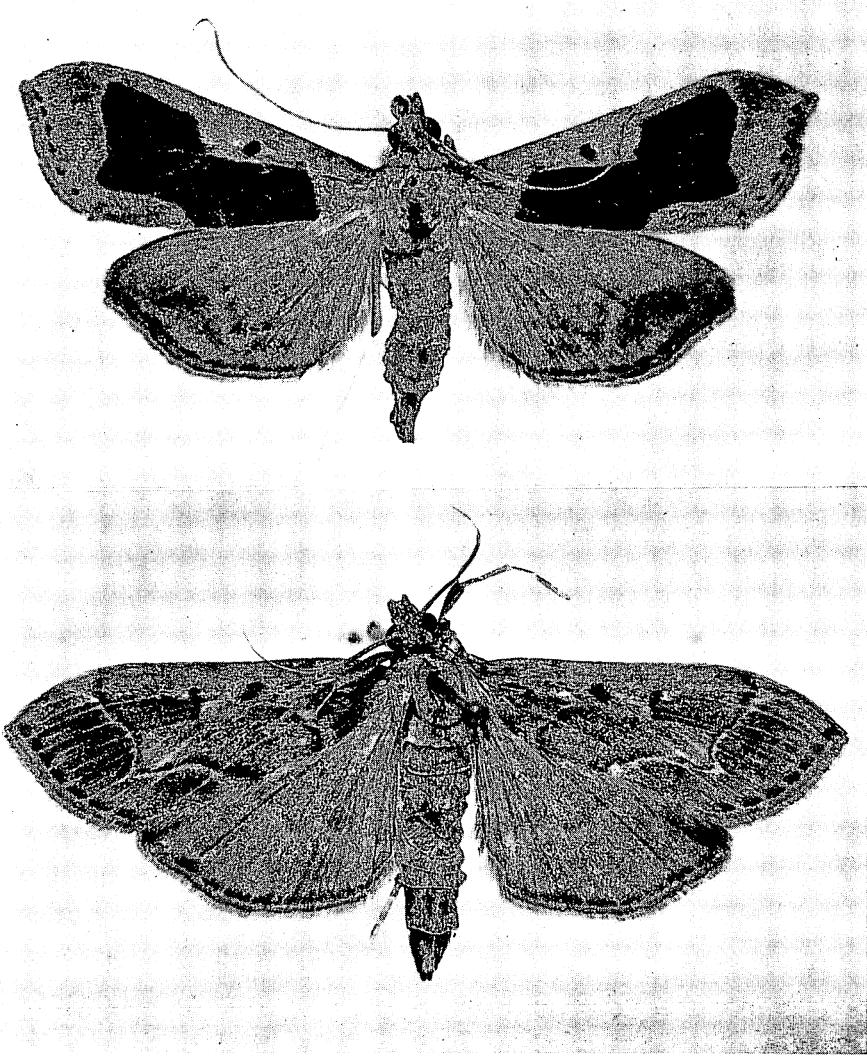


Figure 63—*Hedylepta*. Above: *euryprora* (Meyrick); Mt. View, Hawaii; reared from banana; length of a fore wing, 12 mm.; compared with the type. Below: Type of *fullawayi* (Swezey); Kona, Hawaii; reared from banana; length of a fore wing, 15 mm.

***Hedylepta demaratalis* (Walker), new combination** (figs. 62, 64, 66).*Botys Demaratalis* Walker, 1859:1009.*Omiodes demaratalis* (Walker) Meyrick, 1888:216; 1899:205. Swezey, 1907: 12-13, pl. 2, fig. 3, pl. 3, fig. 4.*Nacoleia demaratalis* (Walker) Hampson, 1898:699.*Phostria demaratalis* (Walker) Klima, 1939:132.

Endemic. Niihau, Kauai, Oahu (type locality ? Walker gave no information

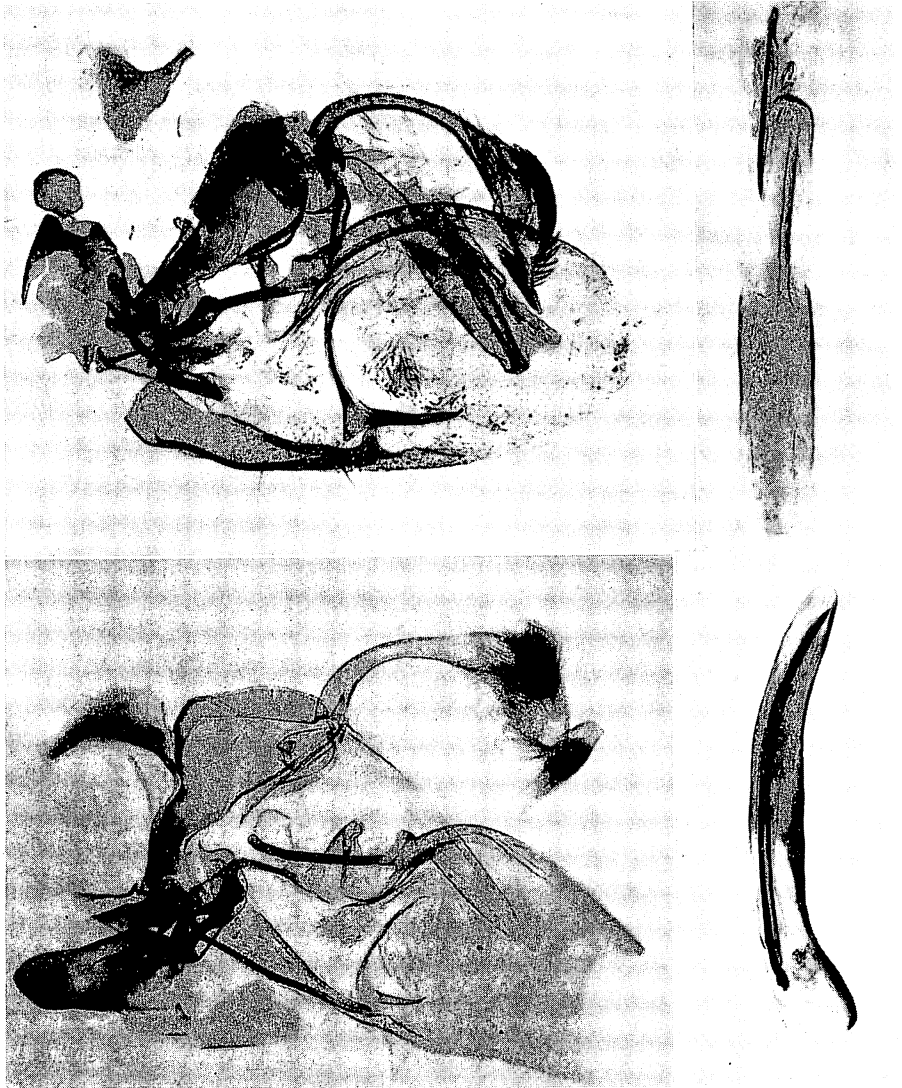


Figure 64—Male genitalia of *Hedylepta*, lateral views, left valves removed. Above: *demaratalis* (Walker); northwest Koolau Mts., Oahu. Below: *epicentra* (Meyrick); Oahu; apex of valve broken off.

regarding the collector or source of the original specimens, and the type in the British Museum bears no locality label; perhaps the type was collected by the Beechey Expedition, 1825-1828), Molokai, Maui, Hawaii.

Hostplants: *Digitaria pruriens*, *Panicum purpurascens*, *Panicum torridum*, *Paspalum conjugatum*.

The caterpillars roll the leaves of grasses.

Full-grown caterpillar.— . . . Length 22-25 mm.; grass-green where the contents of alimentary canal show through, otherwise pale yellowish; head testaceous, a black spot including ocelli, a round black spot in middle of each half of face in front, a tiny blackish dot on postero-ventral margin of head, some pale brownish mottling on upper part of head; mandibles brown, apical half black. Cervical shield with a strong black posterior and lateral margin, interrupted in median line behind; a few tiny dots near dorsal anterior margin, also a few faint ones near posterior margin;

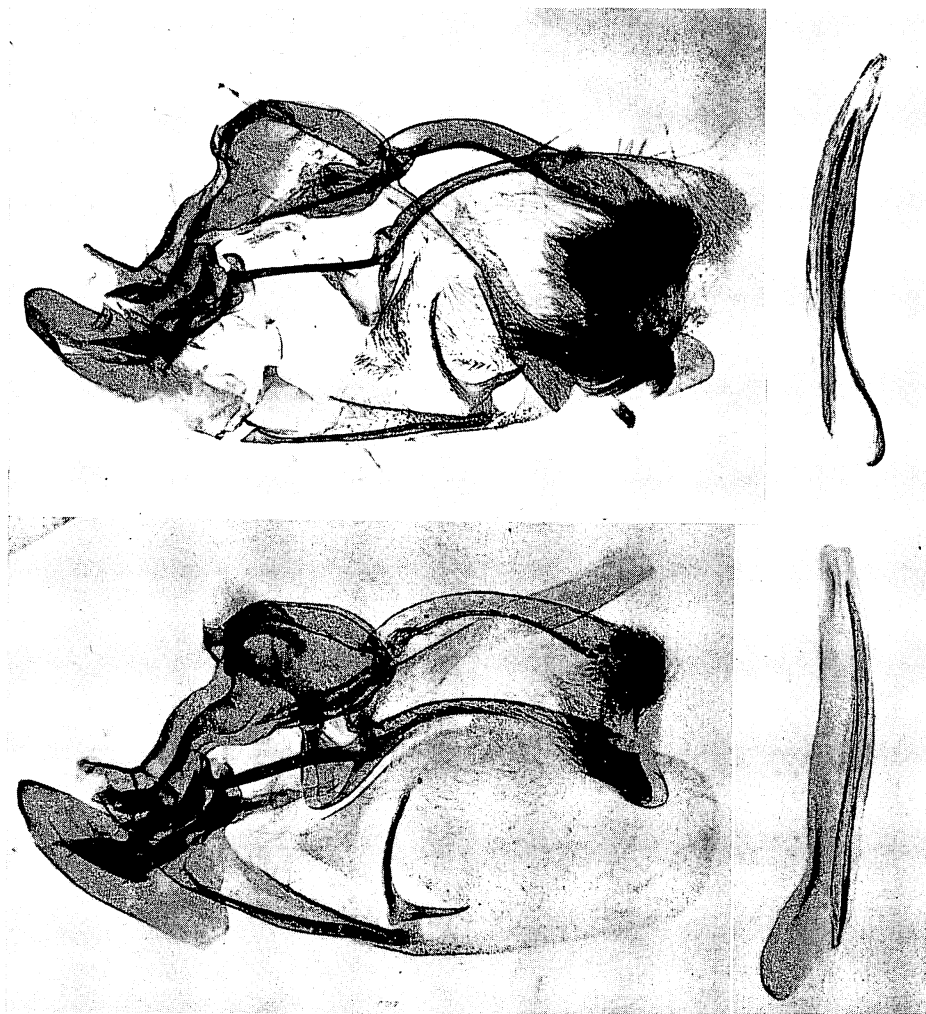


Figure 65—Male genitalia of *Hedylepta*, lateral views, left valves removed. Above: *euryprora* (Meyrick); Oloa, Hawaii. Below: *iridias* (Meyrick); Kilauea, Hawaii.

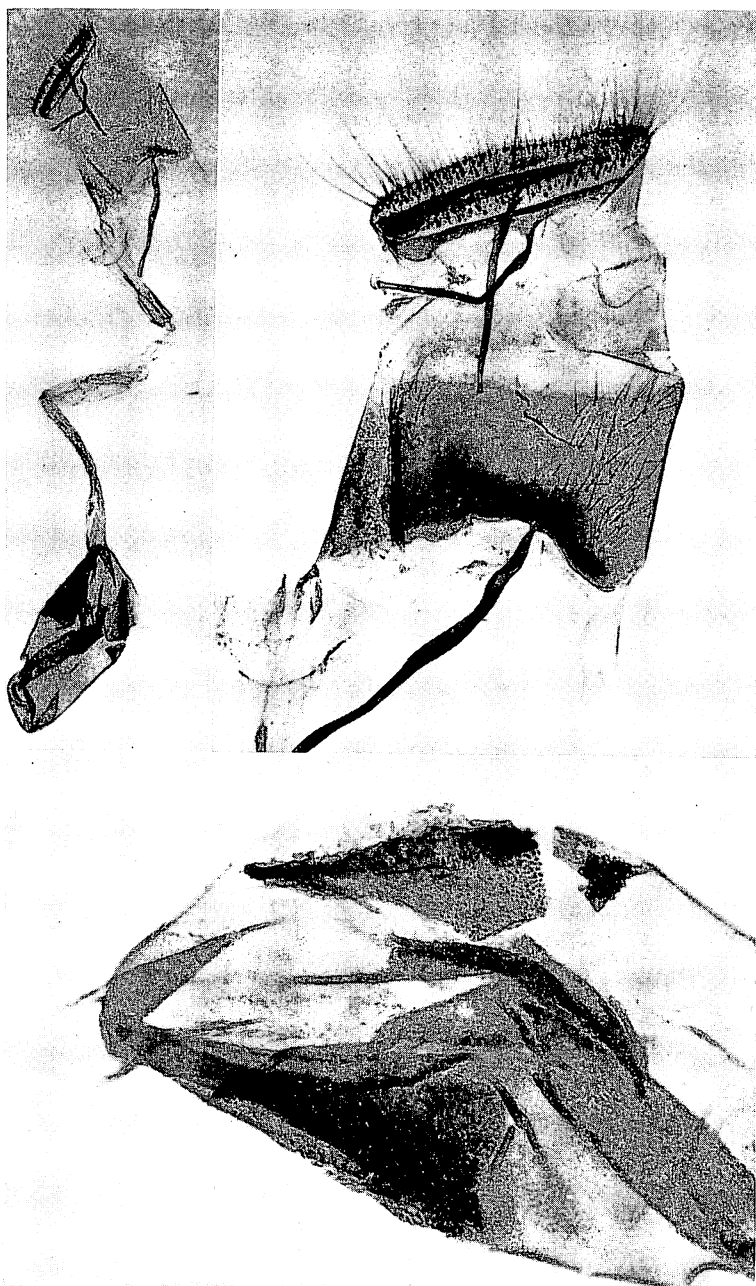


Figure 66—Female genitalia of *Hedylepta demaratalis* (Walker); northwest Koolau Mts., Oahu.

a large black spot, with a smaller one behind it in each lateral lobe of cervical shield; tubercles iv + v and vi are partially brown-margined. Tubercles i, ii and iii of segment 3, and i and ii of segment 4 have black markings not always complete, heaviest on anterior margin; tubercles i, ii and iii of segments 11, 12 and 13 are mostly marked with black in some part of the margin, sometimes some of them entirely surrounded; often some faint markings on some of the tubercles of the other segments, sometimes forming two rows of faint marks a little above the line of spiracles.

Pupa.—12 mm. long, very dark brown; spiracles slightly raised; hairs very delicate, distributed as in other *Omiodes*; cremaster blunt-pointed, with 8 hooked spines. Pupa formed in place where the caterpillar has lived. Pupal period about 12 days. (Swezey, 1907:12-13, pl. 2, fig. 3, pl. 3, fig. 4.)

***Hedylepta giffardi* (Swezey), new combination (fig. 69).**

Omiodes giffardi Swezey, 1921:469.

Phostria giffardi (Swezey) Klima, 1939:132.

Endemic. Hawaii (type locality: Kilauea).

Hostplant: *Isachne distichophylla* (a native grass).

This is very close to *accepta*, and it may be no more than a subspecies or variety. Although Swezey did not describe the larva in detail, and no larvae have been preserved, he did note that the caterpillar has more blackish markings on the thorax than has *accepta*.

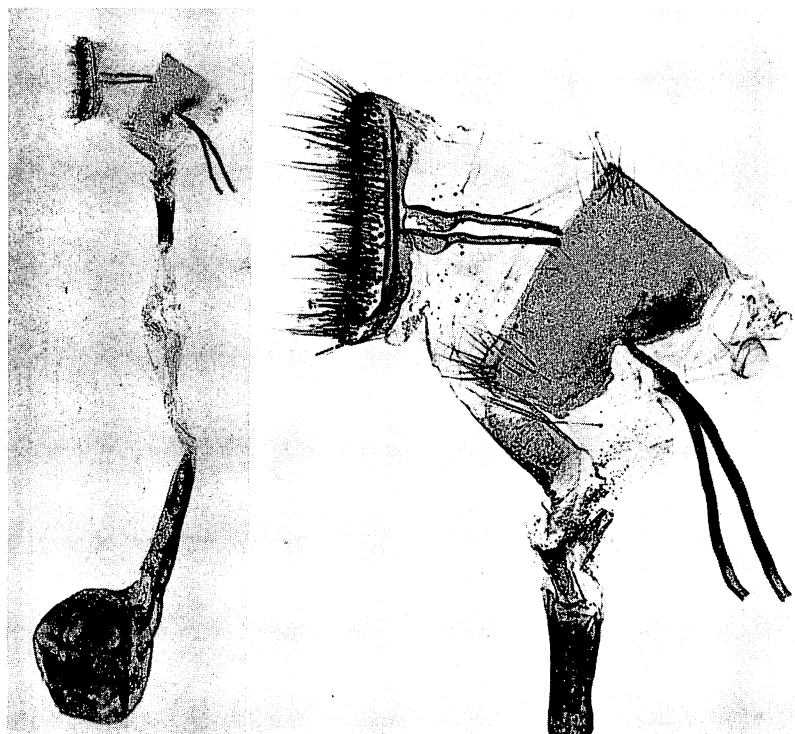


Figure 67—*Hedylepta epicentra* (Meyrick), female genitalia; Oahu.

Hedylepta epicentra (Meyrick), **new combination** (figs. 62, 64, 67).

Omiodes epicentra Meyrick, 1899:203. Swezey, 1907:29.

Phostria epicentra (Meyrick) Klima, 1939:131.

Endemic. Oahu (type locality: Waialua).

Hostplant: Sedge ?

Dr. Swezey once told me that according to Dr. Perkins, this species may have been common in the early days in the swamps which no longer exist in the Kewalo-Waikiki areas of Honolulu. In spite of careful search by Swezey, he never found the species, which was collected only by Perkins. It may be extinct.

Hedylepta euryprora (Meyrick), **new combination** (figs. 63, 65, 68).

Omiodes euryprora Meyrick, 1899:202. Swezey, 1907:29-30; 1954:135, fig. 22.

Phostria euryprora (Meyrick) Klima, 1939:131.

Endemic. Hawaii (type locality: Olaa, 2,000 feet).

Hostplant: Banana.

Dr. Perkins recorded this species from Mt. Tantalus, Oahu (*Proc. Hawaiian Ent. Soc.* 1 (2):42, 1906), but the record was evidently based upon a misidentified specimen; possibly *scotaea* was the species involved.

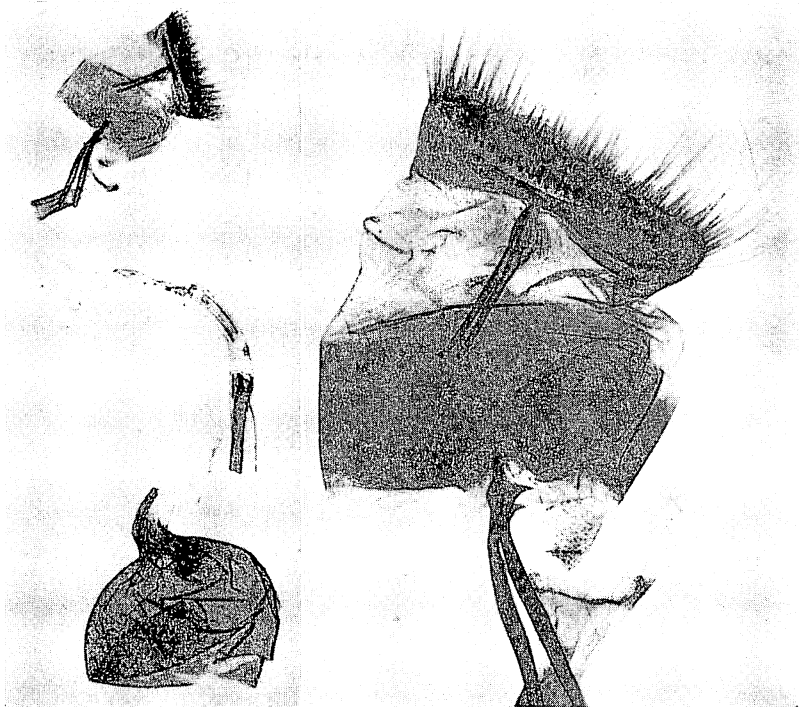


Figure 68—*Hedylepta euryprora* (Meyrick), female genitalia; Olaa, Hawaii.

***Hedylepta fullawayi* (Swezey), new combination (fig. 63).**

Omiodes fullawayi Swezey, 1913:272; 1954:135, fig. 22.

Phostria fullawayi (Swezey) Klima, 1939:133.

Endemic. Hawaii (type locality: Kona).

Hostplant: Banana.

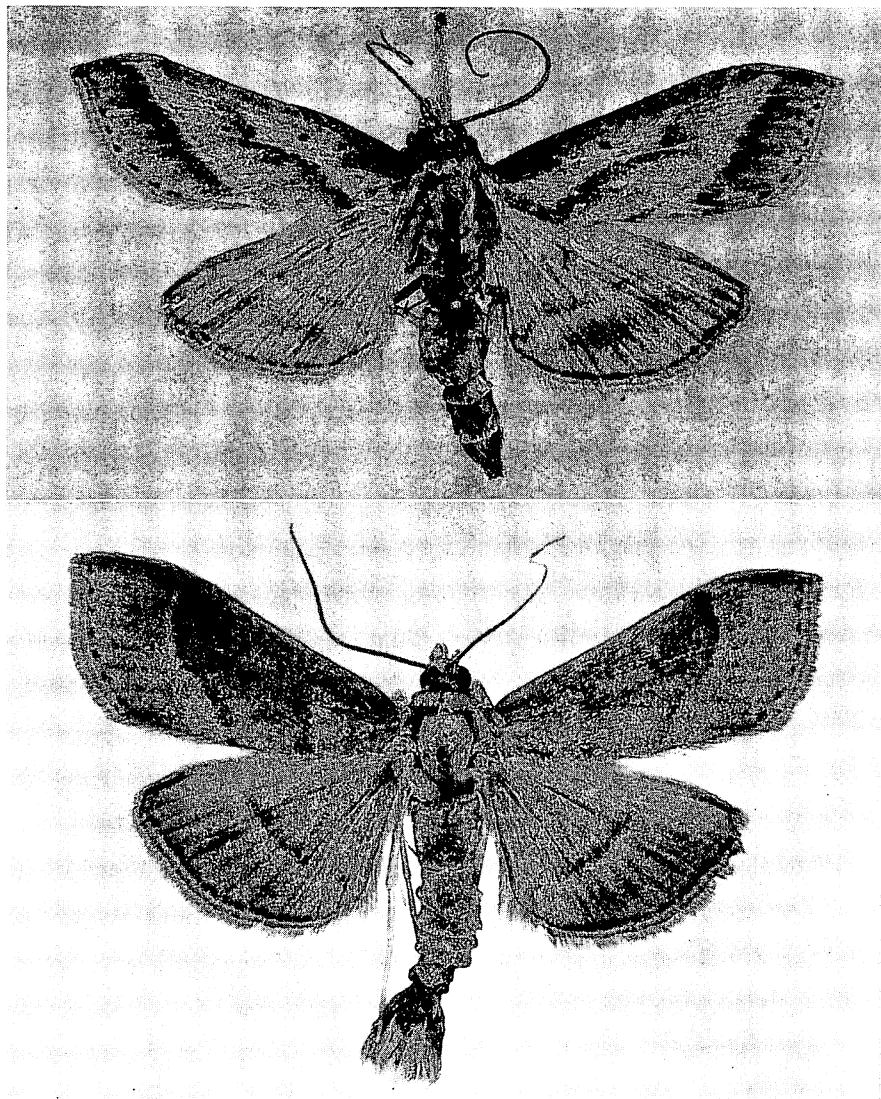


Figure 69—*Hedylepta*. Above: The type of *gifardi* (Swezey); Kilauea, Hawaii; reared from *Isachne distichophylla*; length of a fore wing, 12 mm. Below: *iridias* (Meyrick); Kilauea, Hawaii; length of a fore wing, 12 mm.; compared with the type.

Hedylepta iridias (Meyrick), **new combination** (figs. 65, 69, 72).

Omiodes iridias Meyrick, 1899:203. Swezey, 1907:19–21, pl. 2, fig. 6, pl. 3, fig. 2.

Phostria iridias (Meyrick) Klima, 1939:131.

Endemic. Hawaii (type locality: Kilauea).

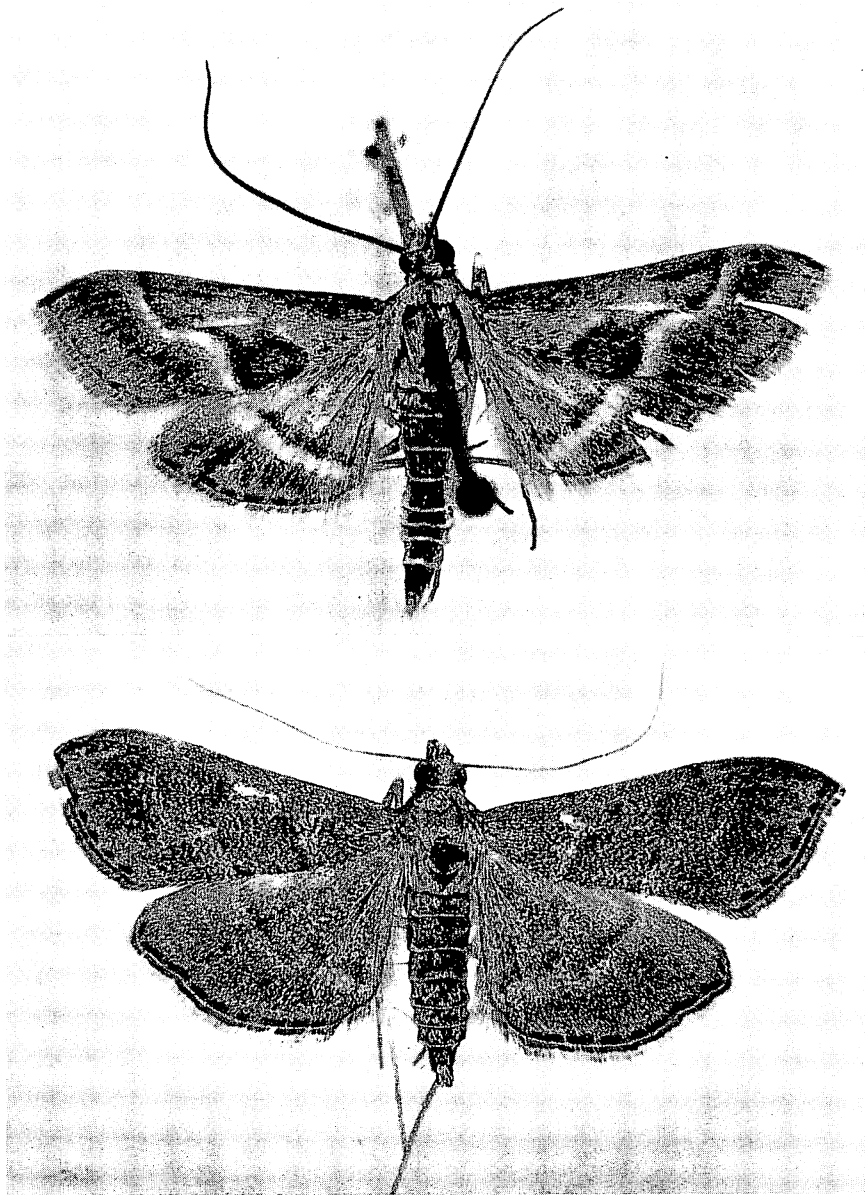


Figure 70—*Hedylepta*. Above: Type of *laysanensis* (Swezey); Laysan Island; length of a fore wing, 10 mm. Below: *localis* (Butler); Honolulu; length of a fore wing, 10.5 mm.; compared with the type.

Hostplant: *Astelia veratroides*.

Dr. Swezey told me that he found the caterpillars feeding on the inner leaves of the crown of the plant and where the leaves are close together. The young caterpillars are well hidden by the dense woolly material which covers the leaf surface, especially the young leaves. The larvae eat one side of the leaf and the mesophyll and leave the opposite epidermis, and pupation takes place in a slight cocoon in the same place.

Swezey (1907:19–21, pl. 2, fig. 6, pl. 3, fig. 2) has given an account of the species, including the following on the larva and pupa:

Caterpillar.— . . . Length about 27 mm.; rather slender; pale whitish green, the dorsal line brownish, younger ones quite pale. Head similar to *O. accepta*, with the addition of black dot on postero-ventral margin, and a brownish dot above ocelli. Cervical shield has black lateral margins; two black spots in lateral lobes, the anterior ones elongate, the posterior ones round; two tiny dots near the middle near anterior margin; the tubercle in front of prothoracic spiracle has a little black on upper margin; two brownish spots on each side between segments 2 and 3. Tubercle i of segment 3 is a little blackened on lower margin, and tubercle ii is heavily black-margined all around except a little space on the upper side. Tubercles i and ii of segments 11 and 12 are more or less faintly margined all around, and tubercle iii of segment 12 is more heavily margined on upper side. Tubercles of some of the intermediate segments often faintly margined.

Pupa.—15 mm.; medium brown; wing-cases extending to apex of 4th abdominal segment, leg- and antenna-cases extending to about the middle of the 6th abdominal segment, free beyond the 4th segment; cremaster truncate triangular, with 4 pairs of hooked spines fastened into the cocoon. Very similar to other *Omiodes* pupae. Pupation takes place in a slight cocoon in the caterpillar's "retreat."

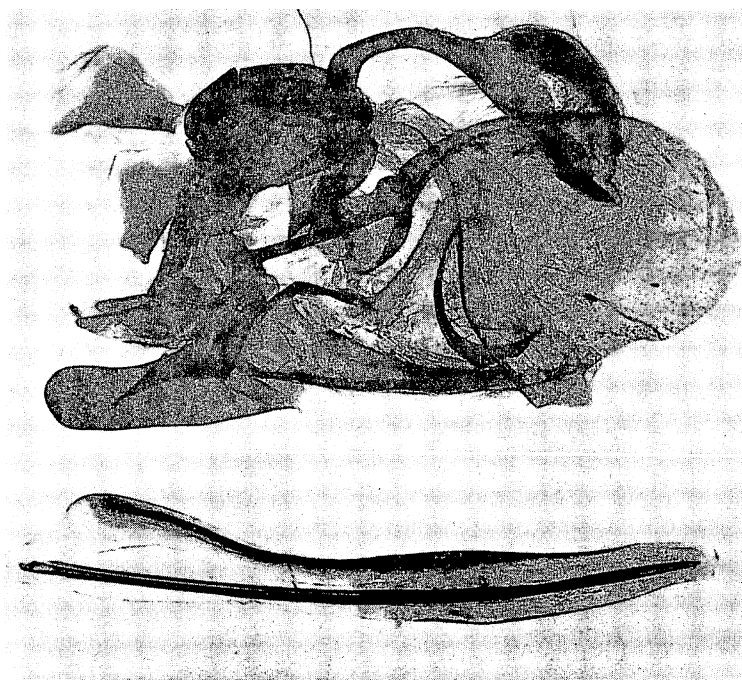


Figure 71—*Hedylepta localis* (Butler), lateral view of male genitalia, left valve removed; Kauai.

Hedylepta laysanensis (Swezey), **new combination** (fig. 70).*Omiodes laysanensis* Swezey, 1914:19.*Phostria laysanensis* (Swezey) Klima, 1939:133.

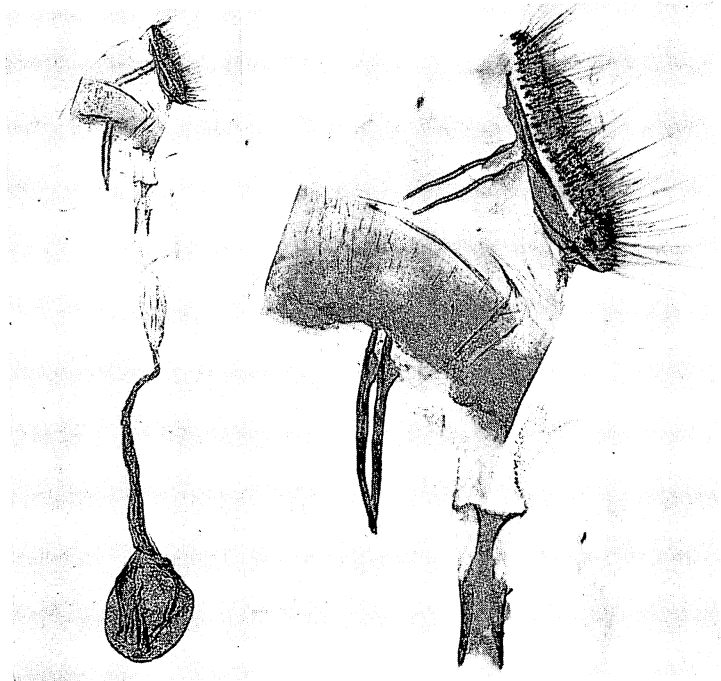
Endemic. Laysan (type locality).

Hostplant: Grass ?

This species is the only member of the genus described from the leeward island chain.

Hedylepta localis (Butler), **new combination** (figs. 70, 71, 73).*Botys localis* Butler, 1879:271.*Omiodes localis* (Butler) Meyrick, 1888:217. Swezey, 1907:11, pl. 2, fig. 1, pl. 3, fig. 3.*Nacoleia localis* (Butler) Hampson, 1898:699.*Phostria localis* (Butler) Klima, 1939:133.

Endemic. Kauai, Oahu (type locality), Molokai, Maui, Lanai, Hawaii.

Hostplants: *Digitaria pruriens*, *Oplismenus compositus*, *Paspalum conjugatum*, sugarcane (occasional).Parasites: *Angitia blackburni* (Cameron), *Casinaria infesta* (Cresson), *Microbracon omiodivorum* (Terry), *Zaleptopygus flavo-orbitalis* (Cameron).Figure 72—Female genitalia of *Hedylepta iridias* (Meyrick); Kilauea, Hawaii.

Predator: *Odynerus nigripennis* (Holmgren).

The type in the British Museum is a rubbed example with no abdomen, and it bears the following label: "Sand. Id. 79-8." Blackburn wrote Butler that it was

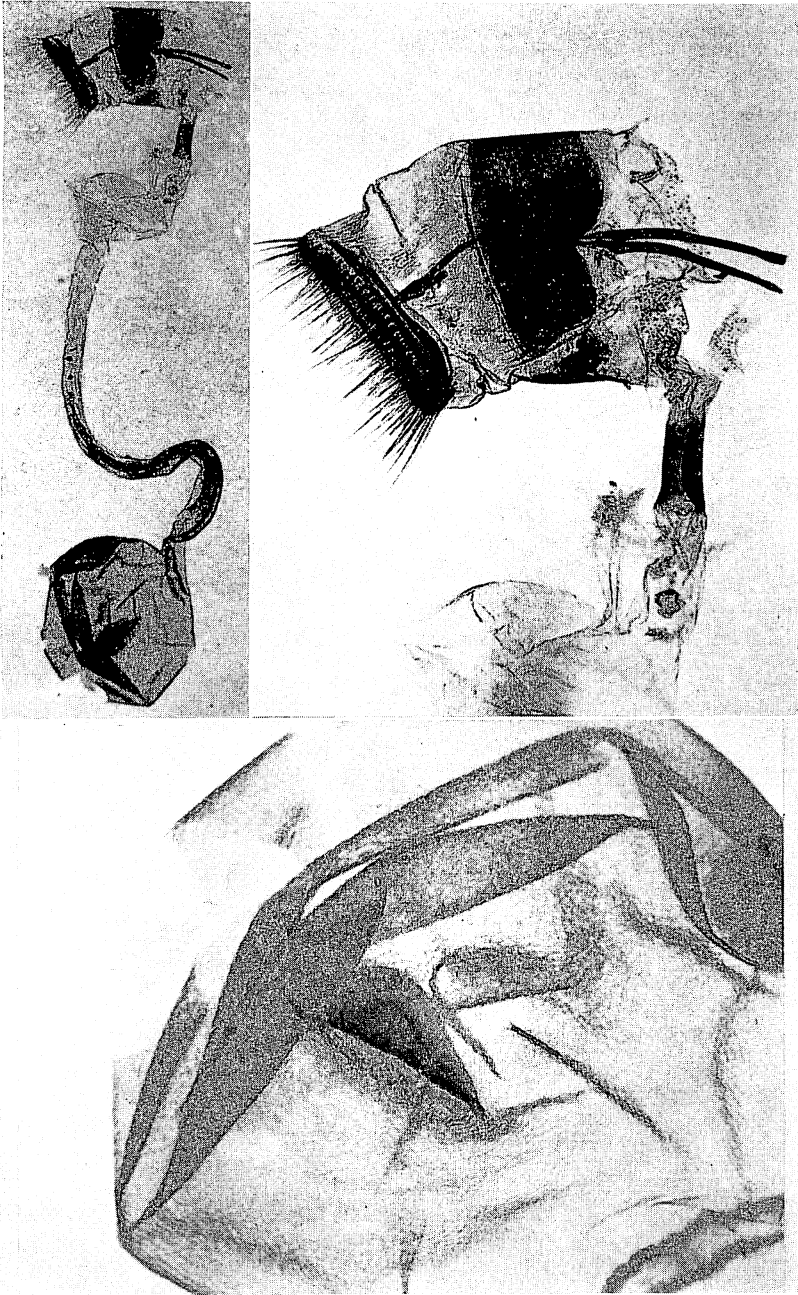


Figure 73—*Hedylepta localis* (Butler), female genitalia; Kauai.

Endemic. Kauai, Oahu (type locality: head of Manoa Valley).

Hostplant: Banana.

Parasites: *Casinaria infesta* (Cresson), *Sierola* species.

Before the appearance of the *Casinaria* parasite in 1921, this species was found by Swezey to be common on wild bananas wherever they were found on Oahu. However, the moth is rarely met with today.

The Hawaiian name for banana is "maia," hence the trivial name.

The caterpillars feed usually on the blade of the leaf close along the midrib, but some feed near the margin of the leaf and roll the edge of the leaf over to make a retreat, according to Dr. Swezey.

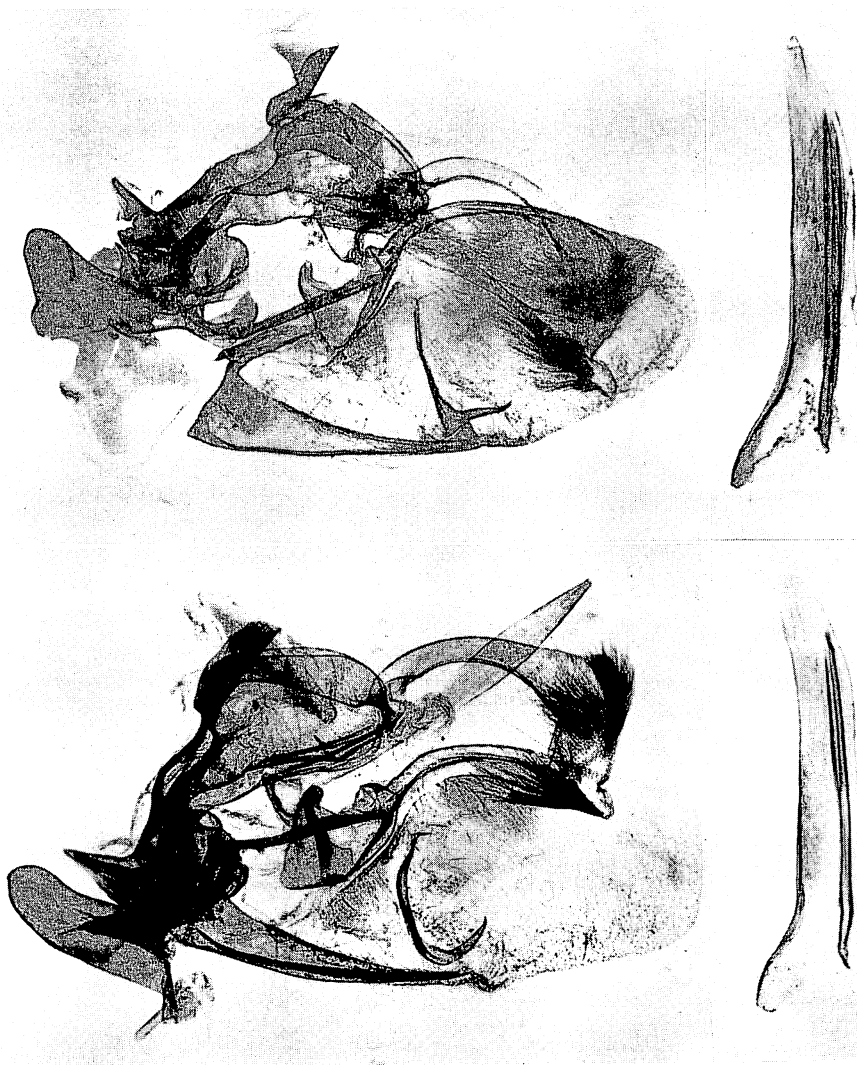


Figure 76—Male genitalia of *Hedylepta*, lateral views, left valves removed. Above: *maia* (Swezey); Oahu. Below: *meyricki* (Swezey); Honomu, Hawaii.

Hedylepta meyricki (Swezey), **new combination** (figs. 74, 76, 78).*Omiodes meyricki* Swezey, 1907:24-27, figs. 1, 2, 3; 1954: 135, fig. 22.*Lamprosema svezeyi* Hampson, 1918:252 (misspelling).*Phostria svezei* Klima, 1939:131 (misspelling).

Endemic. Hawaii (type locality: near Akaka Falls).

Hostplant: Banana.

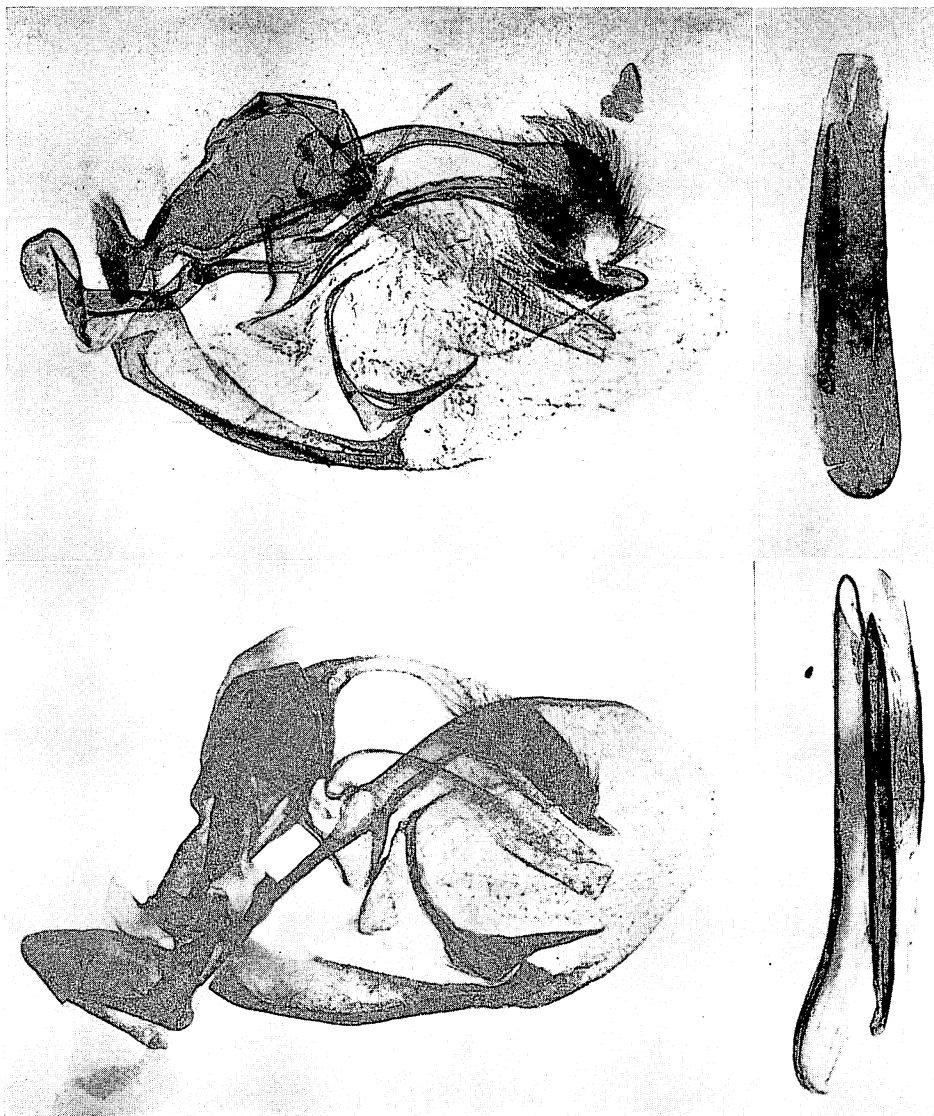
Parasites: *Trichogramma minutum* Riley, *Zaleptopygus flavo-orbitalis* (Cameron).

Figure 77—Lateral views of male genitalia of *Hedylepta*, left valves removed. Above: *monogona* (Meyrick); Kauai. Below: *monogramma* (Meyrick); Kauai.

Hampson incorrectly referred this species and *Merotoma meyricki* Swinhoe to *Lamprosema*, and he renamed Swezey's species. Neither of the species has anything to do with *Lamprosema*.

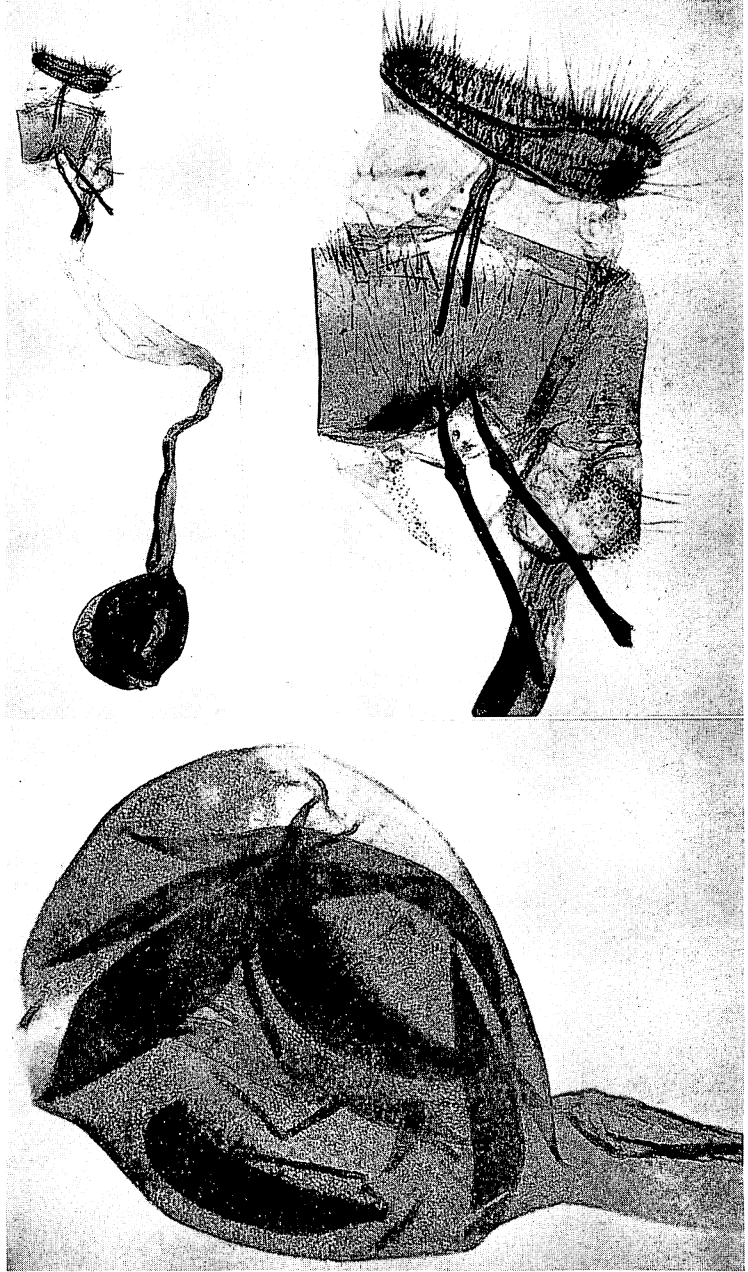


Figure 78—Female genitalia of *Hedylepta meyricki* (Swezey); Honomu, Hawaii.

The adult is almost identical in appearance to that of *blackburni*, but the caterpillars are quite distinct. The larvae of *blackburni* have numerous, distinct black marks on the head and thorax, but the markings on *meyricki* are feeble.



Figure 79—*Hedylepta monogona* (Meyrick), female genitalia; Kauai.

Swezey's original observations (1907:26-27) on the life history are as follows:

The eggs are deposited in clusters on the under surface of banana leaves. The number per cluster, in those I collected, was respectively 30, 40, 52, 60. They are quite similar to other *Omiodes* eggs, but less flat, and the clusters are put directly on the surface, not in a groove or some such place as is customary with *O. accepta* and *O. blackburni*, nor are they arranged in such regular rows.

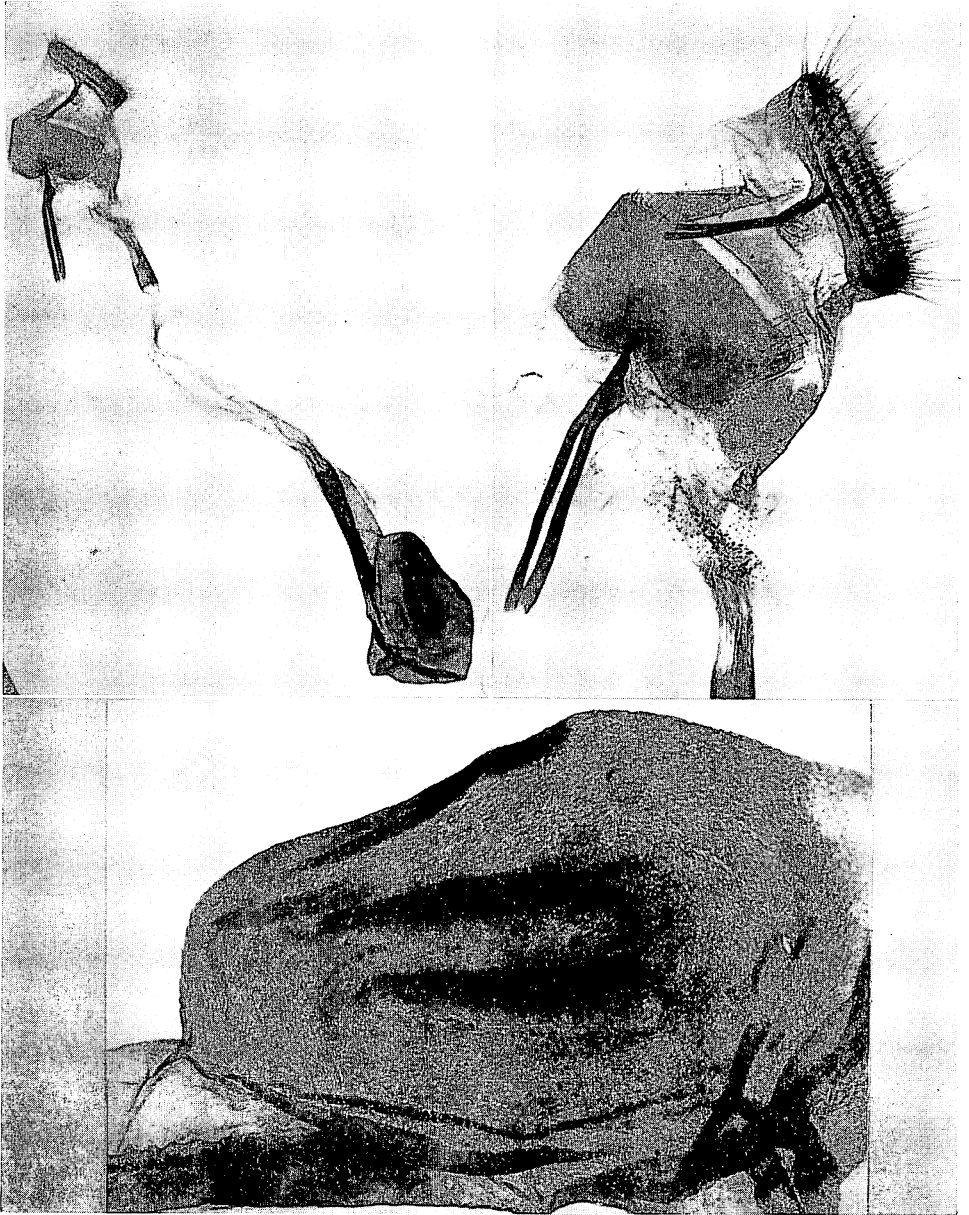


Figure 80—*Hedylepta monogramma* (Meyrick), female genitalia; Oahu.

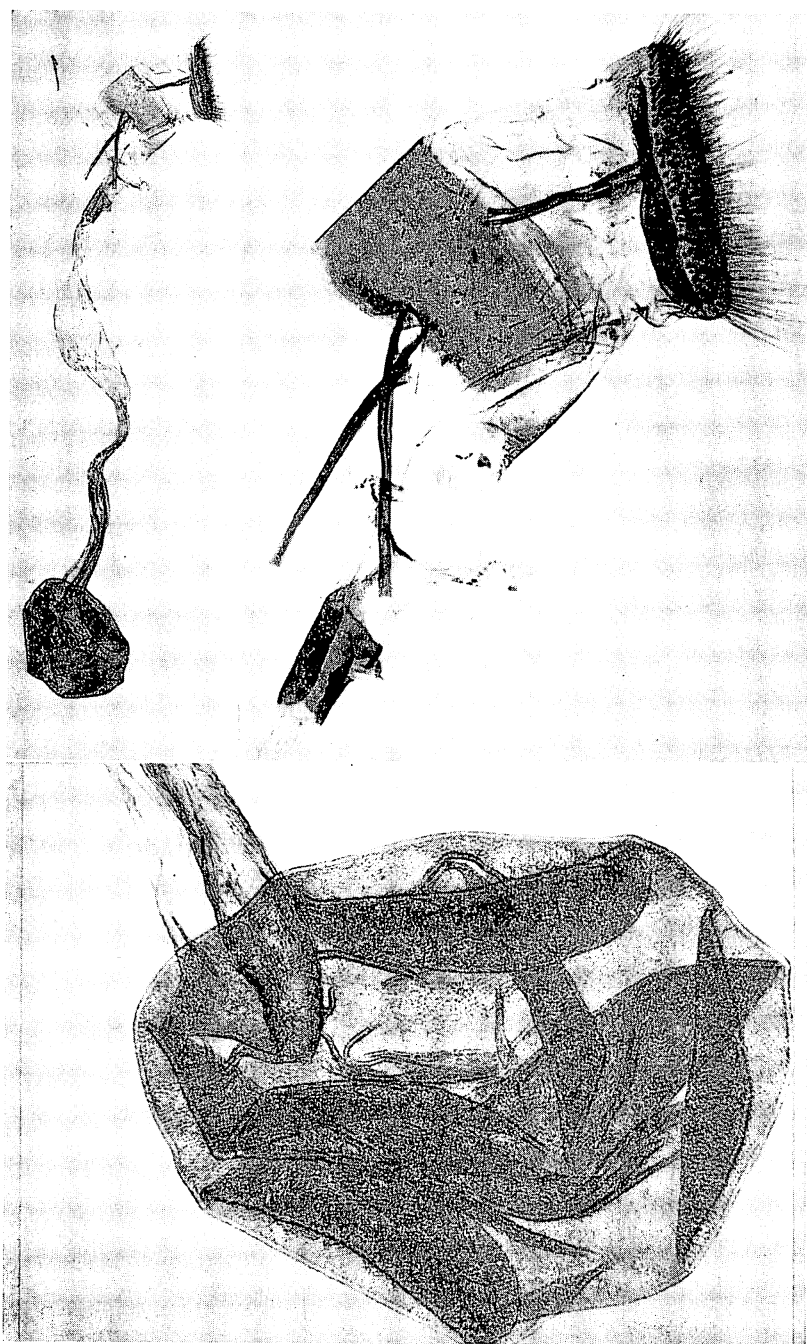


Figure 81—*Hedylepta musicola* (Swezey), female genitalia; Maui.

The freshly-hatched caterpillars are about 2 mm. in length; very pale greenish; head not black as are those of *O. accepta*, but with a black spot at eye-cluster.

2nd Stage.—About 4–5 mm.; similar to previous stage with the addition of a tiny black dot in the middle of front of each lobe of head, a black dot in each lateral lobe of cervical shield, and a black dot on tubercle ii of segment 3.

3rd Stage.—About 8–10 mm.; similar to previous stage, but the black markings are more conspicuous, and there are also two short, faint, oblique lines near middle of head and a little higher up than the two round spots in front.

4th Stage.—About 12–15 mm.; very pale bluish-green; the white fat bodies show plainly through the transparent skin along each side of the dorsal vessel; head concolorous with the body, with black markings as in previous stage, but still more conspicuous (in some caterpillars, in addition to these markings, there are two transverse oval spots, one on each side of head on top); cervical shield with a tiny dot behind the black spot in each lateral lobe, two tiny dots near middle in front; tubercle ii of segment 3 very strongly black-marked in front and below; no other tubercles have black markings.

5th Stage.—About 18–24 mm.; markings similar to previous stage.

6th Stage.—Full-grown caterpillar about 32–35 mm.; light green, body-wall quite transparent so that the numerous fat bodies show through and give a good deal of whitish appearance, especially along the sides of the dorsal vessel; head uniform pale greenish, a roundish black spot in each lobe in front, two short oblique lines near middle a little higher than these, none of the caterpillars have the two oval spots on top of head which some had in two previous stages; ocelli dark brown; cervical shield has a black spot in each lateral lobe, a faint dot behind each, two faint dots near middle in front, lateral lobes not at all black-margined; a black spot on lower anterior part of tubercle ii of segment 3; no markings on the tubercles of the other segments. Although this moth is most similar to *O. blackburni*, its caterpillars are very differently marked from those of the latter, though both have similar feeding habits—these being the only two species among those whose caterpillars are known, which are especially gregarious though those of *O. monogramma* are gregarious to some extent. The head and tubercles of *blackburni* caterpillars have numerous black markings, while in this species the caterpillars have very few markings—perhaps fewer than any other species; in this they are very similar to the caterpillars of *accepta*, though somewhat larger.

The pupa is about 14–17 mm.; similar to the pupa of *O. blackburni*, but a little smaller.

The young caterpillars feed gregariously on the under surface of a banana leaf along the side of the midrib. They spin a slight web for mutual protection, being covered by this and their excrement which is caught and retained by the web. They eat the lower epidermis and the parenchyma of the leaf, leaving the upper epidermis, making it look like dead spots in the leaf where they have fed. When about half-grown, they eat the whole substance of the leaf making a ragged appearance; and they become more separated and roll up the edge of the leaf for a "retreat." They molt five times at intervals of about three days, and about 7–10 days between the 5th molt and the time of pupation, which gives 22–25 days for the length of the caterpillar stage. The pupa is formed inside a slight cocoon, made in the "retreat" of the caterpillar, or some other convenient place for seclusion and shelter. The pupal period is about 11 days.

Hedylepta monogona (Meyrick), **new combination** (figs. 75, 77, 79).

Omiodes monogona Meyrick, 1888:216; 1899:206. Swezey, 1907:28–29, pl. 2, fig.

11, pl. 4, figs. 6–7; 1954:80.

Omiodes liodyta Meyrick, 1888:217. Synonymy by Meyrick, 1899:206.

Nacoleia monogona (Meyrick) Swezey, 1915:106.

Phostria monogona (Meyrick) Klima, 1939:132.

The Hawaiian bean leafroller.

Endemic. Kauai, Oahu (type locality?, none cited by Meyrick, and the type bears only the Blackburn label "Hawaiian Is. TB/81," and the type of *liodyta* bears the same data), Molokai, Maui, Lanai, Hawaii. Swezey (1954:80) said that it was restricted to Oahu, but that is a slip of the pen.

Hostplants: *Canavalia galeata*, *Dolichos lablab*, *Erythrina monosperma* (principal and native hostplant), garden bean (occasional), *Mucuna gigantea*, *Strongylodon lucidum*.

Parasites: *Angitia blackburni* (Cameron), *Brachymeria obscurata* (Walker), *Casinaria infesta* (Cresson), *Zaleptopygus flavo-orbitalis* (Cameron); parasitism often high.

Predator: *Odynerus nigripennis* (Holmgren).

Dr. Swezey has given me the following notes: The caterpillars feed on the leaves of the native "wiliwili" tree, *Erythrina monosperma*, and are probably always to be found where this tree grows on dry rocky slopes of ridges at the lower levels. They feed beneath a turned over portion of the leaf, or between leaves that are in close contact, which they web together; then they feed on the leaf substance leaving only the outer epidermis. Pupation takes place in the same place.

Swezey's original notes on the caterpillar (1907:28-29, pl. 2, fig. 11, pl. 4, figs. 6, 7) are as follows:

Caterpillar.— . . . Length about 22 mm.; dark green, due to the contents of the alimentary tract, light yellowish green when the latter does not contain green plant substance. The head has the usual two large roundish black spots on the face, from each of these usually a black band extends obliquely to the periphery, beneath this and parallel to it is a shorter black band, not reaching the periphery; a black band extends from ocelli around the periphery, more or less interrupted on the vertex; two parallel short black bands in the middle of upper part of face; two dots a little above the clypeus, and a little higher are two very tiny dots; a tiny dot at postero-ventral angle of head; antennae black-tipped. Cervical shield more or less completely and strongly black-margined, interrupted at middle posteriorly, in front broken into 8 or 10 dots; a few tiny dots near middle and a little in front of posterior margin; a longitudinal black bar in each lateral lobe, sometimes divided into two spots. Tubercles of all segments more or less black-margined, those of segment 3 usually most strongly margined, those of segments 4, 11 and 12 nearly as strongly margined. In younger stages the head has fewer markings, and the supra-spiracular lines of tubercles are entirely black.

Pupa.—Length 9 mm., medium brown, similar to *O. accepta*. Pupal period 11-13 days.

Hedylepta monogramma (Meyrick), **new combination** (figs. 75, 77, 80).

Omiodes monogramma Meyrick, 1899:205, pl. 5, fig. 21. Swezey, 1907:18, pl. 2, fig. 9, pl. 3, fig. 7.

Phostria monogramma (Meyrick) Klima, 1939:132.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet), Oahu, Molokai, Hawaii.

Hostplant: *Dianella odorata*.

Parasite: *Zaleptopygus flavo-orbitalis* (Cameron).

Predator: A planarian worm.

The following note was prepared by Dr. Swezey: The caterpillars feed only on the native liliaceous plant *Dianella odorata*, which is very common in forest areas. They feed on the leaves, which they fold together along the midrib and fasten with silk at the margins. Usually there is one caterpillar per leaf, but I have found several to as many as seven to a leaf. When the caterpillars are young, they begin feeding at the apex of the leaf, and then they gradually work downward, folding together more and more of the leaf as they need it for a hiding place. The surface and substance of the leaf are eaten, leaving the outer epidermis which is left intact in a dried up condition enclosing the accumulation of frass. Pupation takes place in a slight cocoon where the caterpillar has finished eating.

Swezey (1907:19, pl. 3, fig. 7) described the larva and pupa as follows:

Caterpillar.— . . . Length about 20–22 mm.; pale yellowish green; head similar to *O. accepta* except that the two oblique marks near top of head in front are absent, the two spots in the face are much smaller and fainter, and there is a black dot at each postero-ventral angle of head. Cervical shield with black lateral and posterior margin, fainter posteriorly, often interrupted in

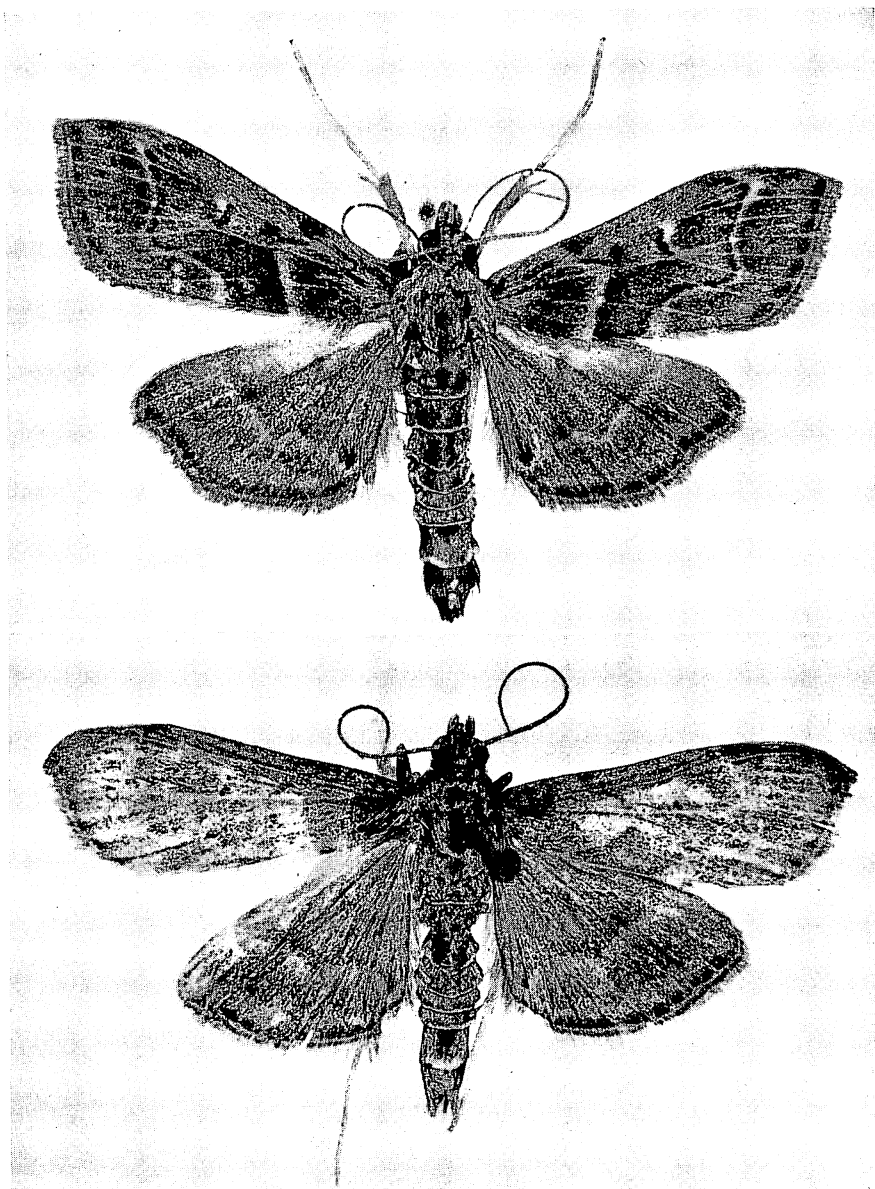


Figure 82—*Hedylepta*. Above: The type of *musicola* (Swezey); length of a fore wing, 12 mm.; reared from banana; Iao Valley, Maui. Below: The type of *pritchardii* (Swezey), an abraded specimen; length of a fore wing, 14 mm.; reared from *Pritchardia* palm; Kulani Road, Hawaii.

dorsal part; two black spots in lateral lobes, the anterior one elongate, the posterior one a mere dot. Tubercles i, ii, iii and iv + v of segment 3 very conspicuously black-margined, those of segment 4 nearly as black-margined, and i, ii and iii of segments 11 and 12 are also nearly as black-margined, those of the other segments more or less margined also.

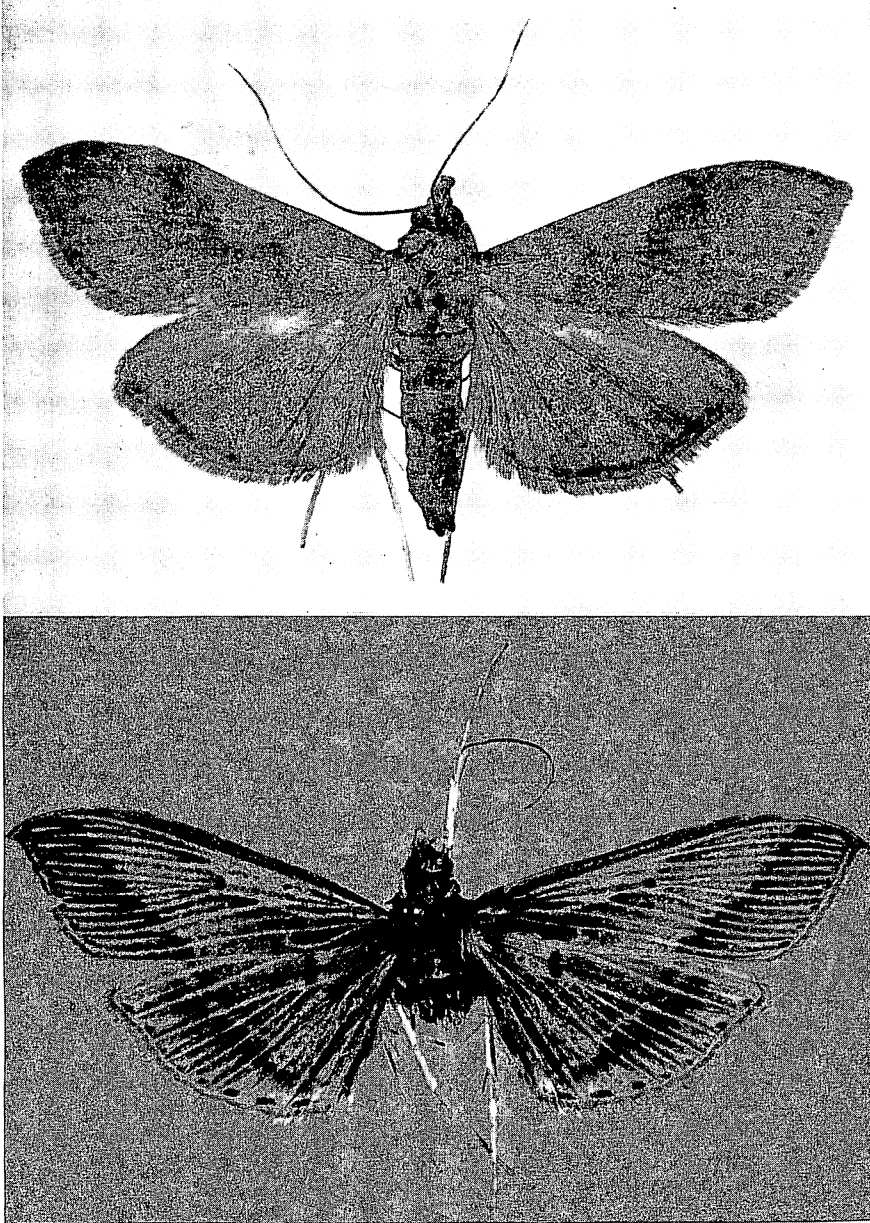


Figure 83—*Hedylepta*. Above: *scotaea* (Hampson); Mt. Olympus, Oahu; length of a fore wing, 11.7 mm.; compared with the type. Below: The unique type of the unusual *telegrapha* (Meyrick); expanse, 38 mm.; Oloa, Hawaii; the undersurface is strongly marked, much as on the dorsum.

Pupa.—Length 12–14 mm., very pale uniform brownish; leg- and antenna-cases extending a little beyond 5th abdominal segment; in other respects similar to other *Omiodes* pupae. Pupal period about 12–14 days.

***Hedylepta musicola* (Swezey), new combination** (figs. 81, 82).

Omiodes musicola Swezey, 1909:40; 1954:135, fig. 22.

Phostria musicola (Swezey) Klima, 1939:133.

Endemic. Molokai, Maui (type locality: Iao Valley).

Hostplant: Banana.

Parasites: *Casinaria infesta* (Cresson), *Zaleptopygus flavo-orbitalis* (Cameron).

The egg-masses were found on the under side of the leaf mostly along the midrib. The eggs were similar to those of other species of *Omiodes*, and about as many in a mass as in those of *O. blackburni*.

Full-grown larva about 27 mm.; dull pale greenish; head testaceous with some light brownish checkering on upper part, a round black spot in each lobe in front, two oblique short black lines on paraclypeus, eyes black with a dark brown streak extending upward from them, a short black line on posterior margin of head extending upward from a black dot at postero-ventral angle; cervical shield with black lateral margins, anterior margin slightly fuscous and with a row of ten dark fuscous dots, a large broad elongate longitudinal black bar in each lateral lobe, on the dorsum between these and near the posterior margin are two groups of five tiny dark fuscous dots; tubercle in front of spiracle with a black line on dorsal margin; tubercles ii on segments 3 and 4 almost entirely blackened, all the other tubercles are at least slightly infuscated, some more so, and those of segments 11–13 and of row iii especially are conspicuously infuscated; spiracles circular, yellowish.

Pupa, 14 mm. long, medium brown, darker on dorsum; wing-cases extend to apex of 4th abdominal segment; leg-cases and antenna-cases extend about two segments farther, free beyond 4th segment; cremaster subconical with a cluster of eight hooked bristles at apex fastened into silk of the cocoon.

The smaller caterpillars fed on the under surfaces along the midrib of the leaf where it was convenient for them to make a web for their protection; larger ones secrete themselves in rolled up edges of the leaves. The pupae are found in the latter place or some other favorable situation. The pupal stage occupied 11 days. (Swezey, 1909:41–42.)

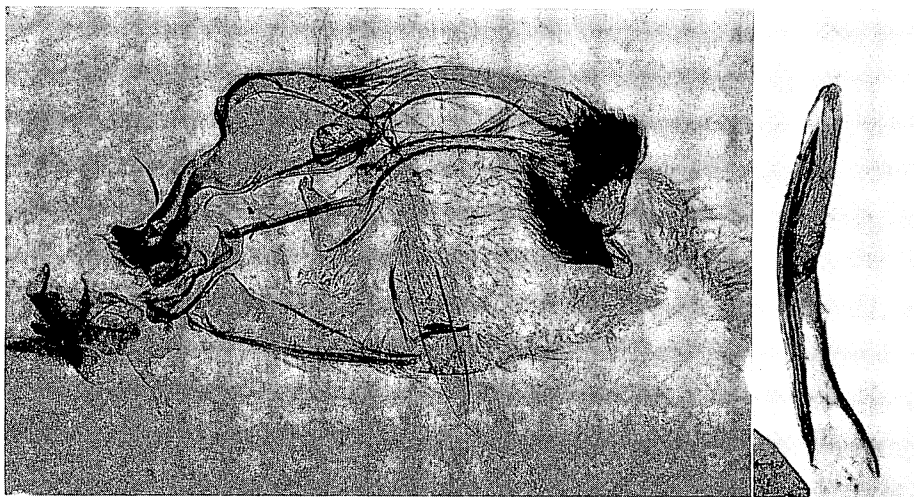


Figure 84—*Hedylepta scotaea* (Hampson), lateral view of male genitalia, left valve removed; Kilauea, Hawaii.

Hedylepta pritchardii (Swezey), **new combination** (fig. 82).

Omiodes pritchardii Swezey, 1948:260.

Endemic. Hawaii (type locality: "along the Kulani road, 9 or 10 miles north-west from Mountain View").

Hostplant: *Pritchardia beccariana*.

More material of this most recently described species is needed for study. It is allied to *blackburni*. Swezey noted that "One caterpillar had the head and cervical plate mostly dark, nearly black, and all dorsal setae of the body segments situated in dark-outlined plates."

Hedylepta scotaea (Hampson), **new combination** (figs. 83, 84, 85).

Nacoleia scotaea Hampson, 1912:442.

Omiodes scotaea (Hampson) Swezey, 1913:235.

Phostria scotala Klima, 1939:132 (misspelling).

Endemic. Oahu, Molokai, Hawaii (type locality: Kilauea).

Hostplant: *Astelia veratroides*.

Parasite: *Sierola dichroma* Perkins.

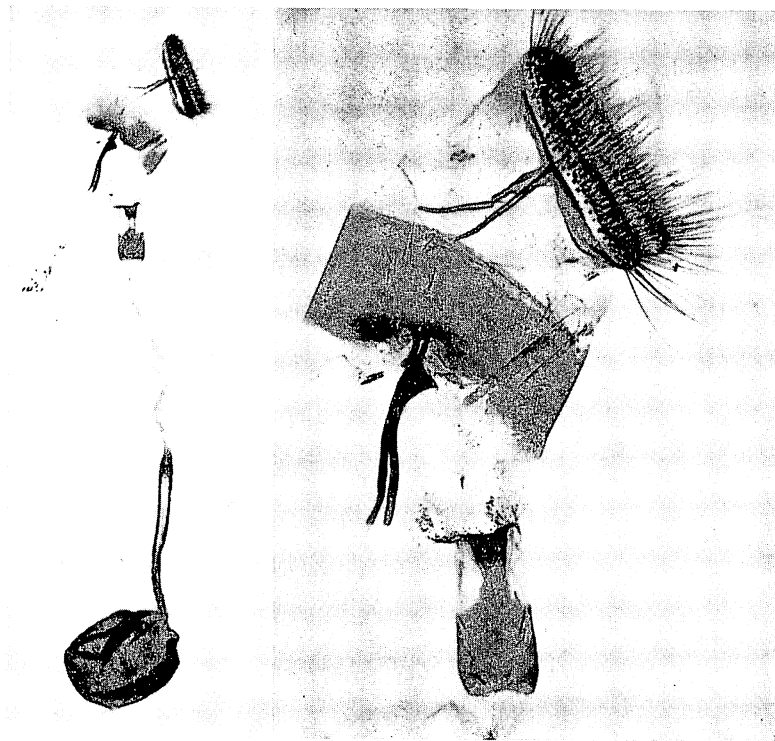


Figure 85—*Hedylepta scotaea* (Hampson), female genitalia; Waikolu, Molokai.

There has been some confusion in literature and collections resulting in the misidentification of this species. It was confused with *asaphombra* by Perkins, and Swezey's account in 1907 under that name belongs to this species.

I have found the caterpillars feeding between the leaves of the crown of the plant where they are close together. They eat the surface and substance of the leaf, leaving the opposite epidermis, which shows as dead portions of the leaves. In some small plants, I found the caterpillars boring down into the stem where they had been feeding between the leaves in the middle of the crown of the plant.

Caterpillar.— . . . Full-grown about 27 mm.; bright green if they have been feeding on the greener leaves, paler if they have fed in the inner part of the crown where there is very little chlorophyll in the leaves; darker green along the dorsal vessel. Head very pale testaceous, the two black spots on the face are much smaller than they are in the other *Omiodes* whose caterpillars are known; ocelli black, a black dot at each postero-ventral angle. Cervical shield with black lateral margin, heavier anteriorly; a large and a small black spot in each lateral lobe, the small one posterior to the other; two tiny dots near middle of anterior margin; tubercle in front of spiracle faintly blackened on upper margin. Tubercle ii of segment 3 has heavy black ventral margin, especially anteriorly. Some markings on margin of tubercles i, ii and iii of segment 12; tubercles of other segments unmarked.

Pupa.—12 mm. long; uniform very pale brown; wing-cases extend to posterior margin of 4th abdominal segment, leg-cases and antenna-cases extend about one and a half segments farther; otherwise similar to *O. accepta*. The pupa is formed in a slight cocoon in the caterpillar's "retreat." Pupal period 11 to 12 days.

***Hedylepta telegrapha* (Meyrick), new combination (fig. 83).**

Omiodes telegrapha Meyrick, 1899:204, pl. 5, fig. 20. Swezey, 1907:30.

Phostria telegrapha (Meyrick) Klima, 1939:131.

Endemic. Hawaii (type locality: Olaa).

Hostplant: Unknown, but grass presumed.

This is one of the finest, most distinctive species of the genus, but, unfortunately, it is known from the unique type only. The type, in the British Museum, has no abdomen. The under surfaces of the wings are strongly marked, much like the dorsum. The white scaling on the veins and the white apical lines between the veins is characteristic. It may be allied to *accepta*. The type was not spread when Meyrick described it, and his figure shows it in its position before it was spread for my study and photograph.

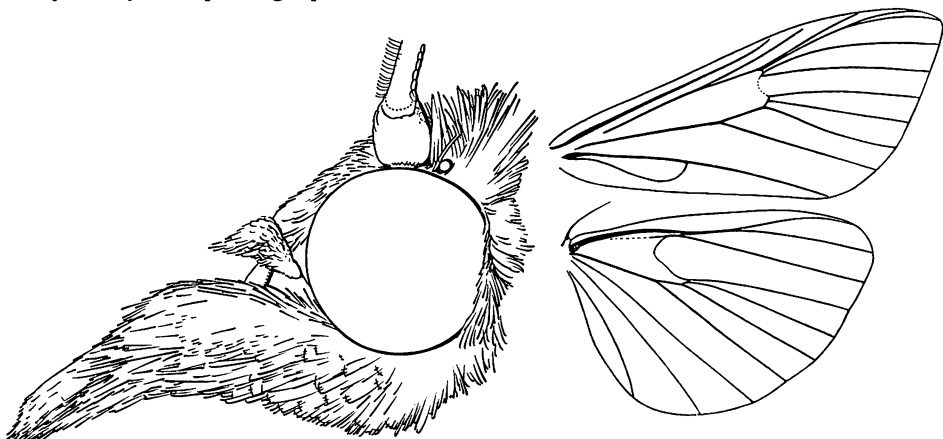


Figure 86—Head and wing venation of *Uresiphila polygonalis* (Denis and Schiffermueller).

Genus **URESIPHITA** Huebner, 1825:353

Uresiphoeta Agassiz, 1846, as an emendation.

This is the first appearance of this genus in Hawaiian literature, and it is now introduced for the reasons outlined below.

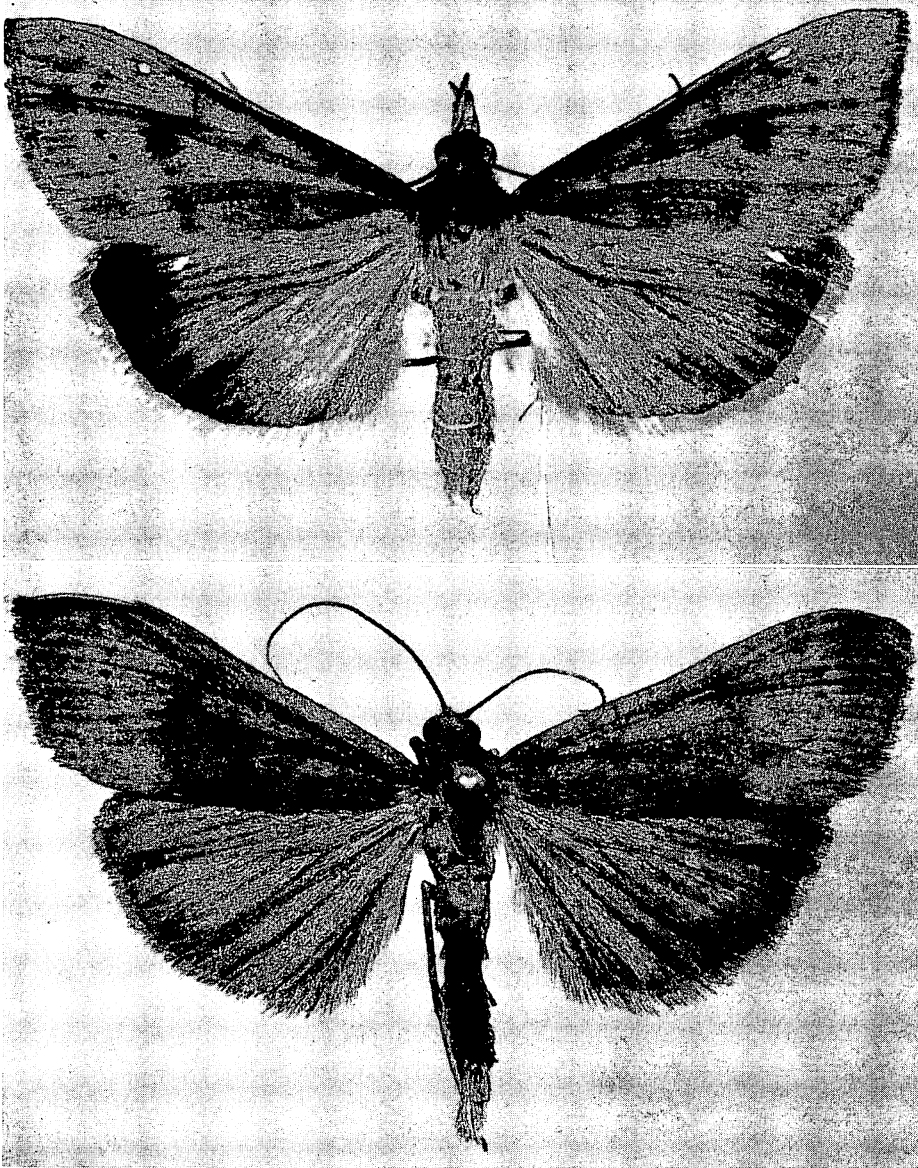


Figure 87—A pair of *Uresiphita polygonalis* (Denis and Schiffermueller). Above: The female type of the synonym, *Mecyna virescens* Butler; "Hawaiian Islands 81-7 139" (Blackburn); expanse, 27 mm. Below: A male from Haleakala, Maui, 5,000 feet; expanse, 30 mm. The color and pattern vary greatly.

Uresiphita polygonalis (Denis and Schiffermueller) (figs. 86, 87, 88, 89). Type of *Uresiphita*.

Pyralis Polygonalis Denis and Schiffermueller, 1775:121.

Mecyna polygonalis (Huebner) Meyrick, 1890:451.

Pyralis Limbalis Denis and Schiffermueller, 1775:122.

Uresiphita limbalis (Denis and Schiffermueller) Huebner, 1825:353.

Mecyna virescens Butler, 1881:329. Meyrick, 1888:225; 1899:225. Hampson, 1899:224. **New synonym.**

Kauai, Oahu, Maui, Hawaii.

Immigrant. A highly variable European species, now wide-spread; first collected in Hawaii before 1881 by Blackburn on Haleakala.

Hostplants: *Acacia koa*, *Sophora chrysophylla* ("mamani") (principal host-plant).

While working on this volume at the British Museum, I became suspicious of the identity of this species when I was studying the wing venation of our pyraustids, and upon searching, I discovered that our *Mecyna virescens* was the same as the type of *Uresiphita*. The moth looks so much "at home" amongst our native Hawaiian pyraustids that it is not surprising that it has for so long been considered one of them. It is, however, rather odd that neither Butler, Meyrick nor Hampson, who were so familiar with the European fauna, noticed the error in identification. Meyrick (1888:225) wrote, "probably nearest to *M. deprivalis* from Ceylon and New Zealand." Hampson, however, came closer to the mark when he placed this species in "*Euresiphita*" next to the New Zealand *maoralis* Felder when he rearranged the collection at the British Museum. He also erroneously

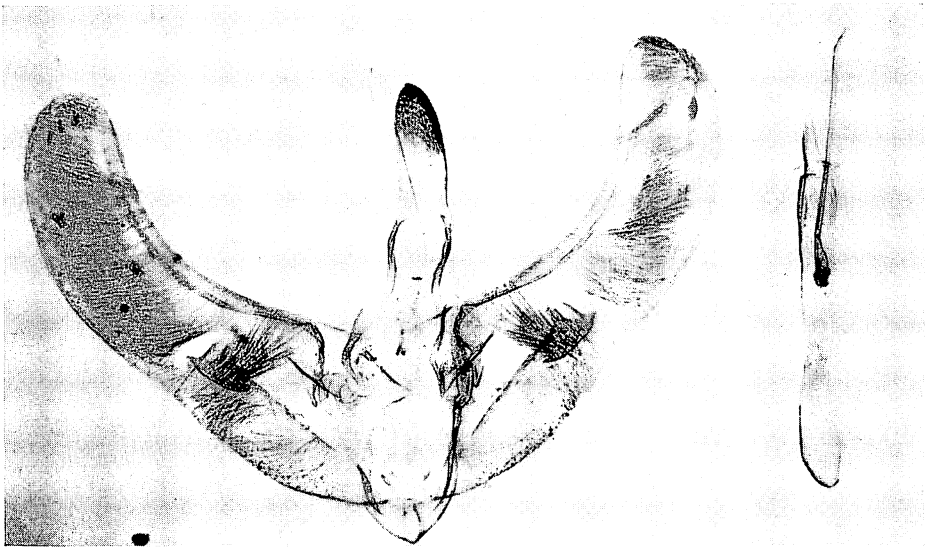


Figure 88—Male genitalia of *Uresiphita polygonalis* (Denis and Schiffermueller); Haleakala, Maui, 5,000 feet.

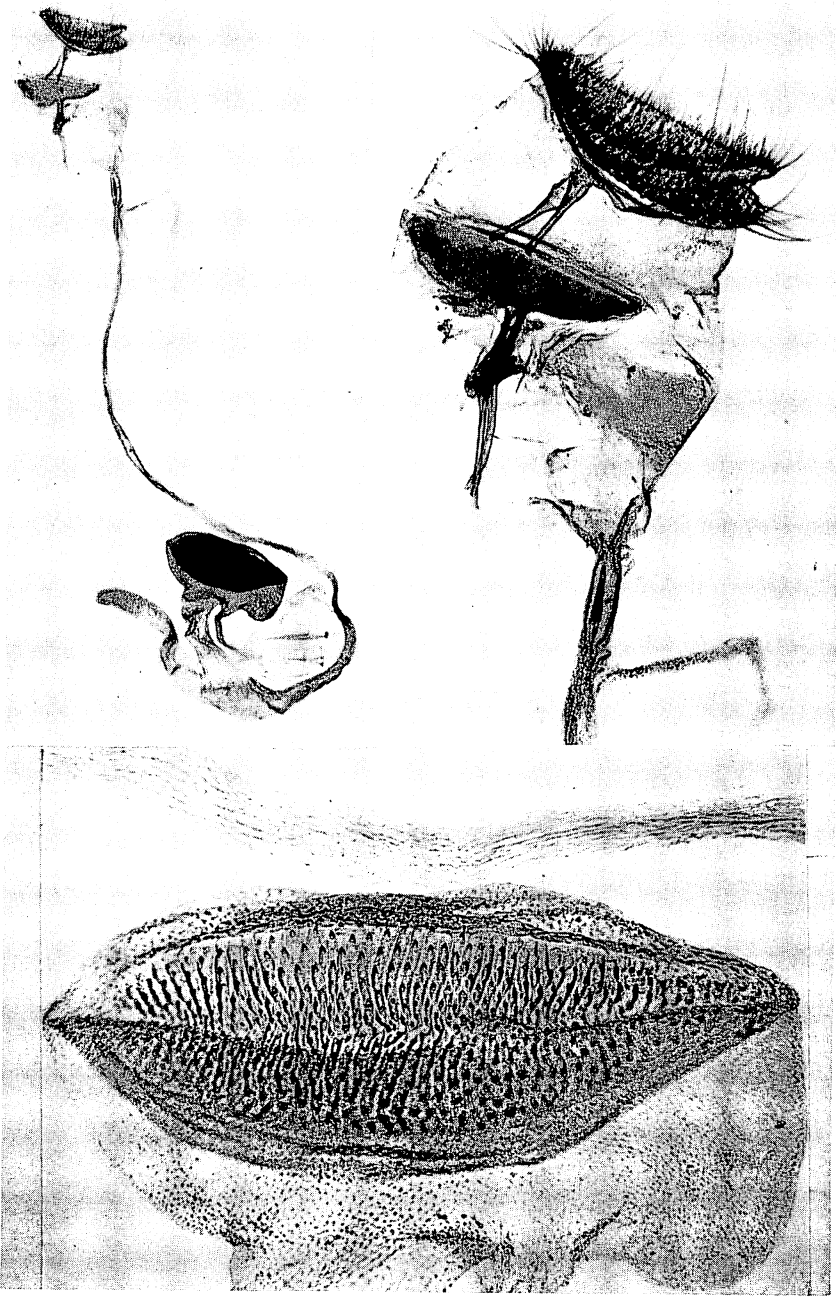


Figure 89—*Uresiphita polygonalis* (Denis and Schiffermueller), female genitalia of the type of the synonym *Mecyna virescens* Butler.

placed our "*Pyrausta*" *phaethontia* there. An examination of the wing venation and especially the genitalia immediately reveals that this species is out of place in the native Hawaiian fauna. In England, the moth feeds upon *Genista* and *Cystisus* and also on legumes. It must have been introduced very early to Hawaii, because it was first collected in Hawaii (on Haleakala, Maui at 4,000 to 5,000 feet) by Blackburn. It is a variable species.

The larvae, large for Hawaiian pyralids, feed in webbed-together leaves, often gregariously. Blackburn made the following notes on the caterpillar: "Shining black, sparingly furnished with long grey-white hairs; head and underside dirty grey; spiracular line bright orange-colour; three pairs of legs (on three segments next behind head), and five pairs of claspers, all dirty semitransparent grey. Forms pupa in a silken cocoon."

Dr. Swezey commented in a letter to me as follows: "As to Blackburn's description of the larva of *virescens*: I do not think that it is very complete, and I would not describe it the way he does, but they are not always the same at different stages of growth. However, the *virescens* caterpillar is distinctly different from the caterpillars of a good many species of *Phlyctaenia* which I have collected and reared. [He refers here to what I call *Oeobia*.] In the first place, the *virescens* caterpillars are much larger and they feed gregariously among webbed leaves, whereas the *Phlyctaenia* caterpillars feed singly. The style of coloration is different. In general, the *virescens* caterpillar is dark, due to a wide longitudinal black band on each side, but the mid-dorsal area is pale. In contrast, the caterpillars of *Phlyctaenia* are green with a few black marks or dots on the segments of the thorax, and sometimes on the head, and these markings are different for each species, according to my observations."

Hampson (1896:418) lists *polygonalis* as a synonym of *gilvata* Fabricius, 1794 (but, of course, *polygonalis* is the earlier name which should have been used; there are probably other names to be added to the synonymy).

Perkins (1913:clx) said:

M. virescens has all the appearance of an endemic insect. It is extremely variable in colour and chiefly abounds at high elevations, 4,000 ft. or more in the mountains. It occurs in great numbers in open places in dry forests composed of *Acacia koa*, *Sophora chrysophylla*, *Myoporum*, etc., and flies readily by day, settling on the herbage, though it is also attracted to light. Its favourite food-plant appears to be *Sophora*, which is sometimes badly eaten by the caterpillars. The latter are of bright colours, and were found to form a favourite food of the fine endemic Passerine bird, *Rhodacanthis palmeri*. These caterpillars also eat the leaves of *Acacia koa* and the moth sometimes occurs in places where no *Sophora* grows, and at a much lower elevation than 4,000 ft.

Genus **OEOBIA** Huebner

Oeobia Huebner, 1825:362; 1826:59; type: *Oeobia numeralis* Huebner, 1825:362.

See Zimmerman, 1956:248, for details of type.

Oebia, typographical error in Huebner, 1825:362, in part, corrected by Huebner in his index, 1826:59; repeated in error by some later authors.

Udea Guenée, in Duponchel, 1845:209; type: *ferrugalis* Huebner, monobasic.

New synonym.

Melanomecyna Butler, 1883:179; type: *Mecyna constricta* Butler, monobasic; synonymized under *Udea* by Shibuya, 1928:275.

Protocolletis Meyrick, 1888:224; type: *Scopula constricta* Butler, monobasic; synonymized under *Pyrausta* by Meyrick, 1890:449.

Pyrausta "Section *Protocolletis*" (Meyrick) Meyrick, 1899:224. **New synonym.**

Protaulacistis Meyrick, 1899:246; type: *Protaulacistis cataphaea* Meyrick, monobasic. **New synonym.**

Notophytis Meyrick, 1932:318; type: *Pyrausta bryochloris* Meyrick, monobasic.

New synonym.

Munroe, 1950:220, description and status of *Udea* in America.

This is a very large genus which occurs at least in America, Eurasia and into the Pacific, but its geographical distribution is masked by confused taxonomy. The name is a new one to the Hawaiian fauna, and there is much confusion concerning it.

It is difficult to ascertain the origin of the ancestor which gave rise to the Hawaiian complex, but I feel that there is little doubt that it was Boreal. It may have come from North America, or it may have come from Japan.

The members of this genus in Hawaii form a large, plastic, endemic complex in an active process of evolution and divergence which has confused previous workers because they examined the species superficially.

In literature, various of our species of this one genus have been placed in the following 18 genera: *Anemosa*, *Aporodes*, *Eurycreon*, *Locastra*, *Loxostege*, *Mecyna*, *Melanomecyna*, *Notophytis*, *Phlyctaenia*, *Pionea*, *Protocolletis*, *Protaulacistis*, *Pyrausta*, *Rhodaria*, *Scoparia*, *Scopula*, *Tholeria* and *Udea*! None of the Hawaiian species can be assigned to these names, as the following discussion will demonstrate.

In the British Museum collection, Hampson placed most of the species in *Calamochrous* and *Hapalia*. In *Fauna Hawaiiensis* (1899, 1904), Meyrick assigned 1 species to *Protaulacistis*, 25 to *Phlyctaenia*, 8 to *Pyrausta*, 1 to "Section *Protocolletis*" under *Pyrausta* (thus partly resurrecting his genus *Protocolletis* which he had merged with *Pyrausta* in 1890), 1 to *Mecyna* and 3 to *Loxostege*. In his final arrangement of his personal collection, which is now in the British Museum, Meyrick transferred *Pyrausta dracontias*, *thermantis*, *brontias* and *psychropa* to *Oeobia*, and he again used his *Protocolletis* as a genus, in which he included *Pyrausta litorea*, *dryadopa*, *chloropis*, *constricta*, *phaeothontia*, and *Loxostege conisalis* and *helioxantha*.

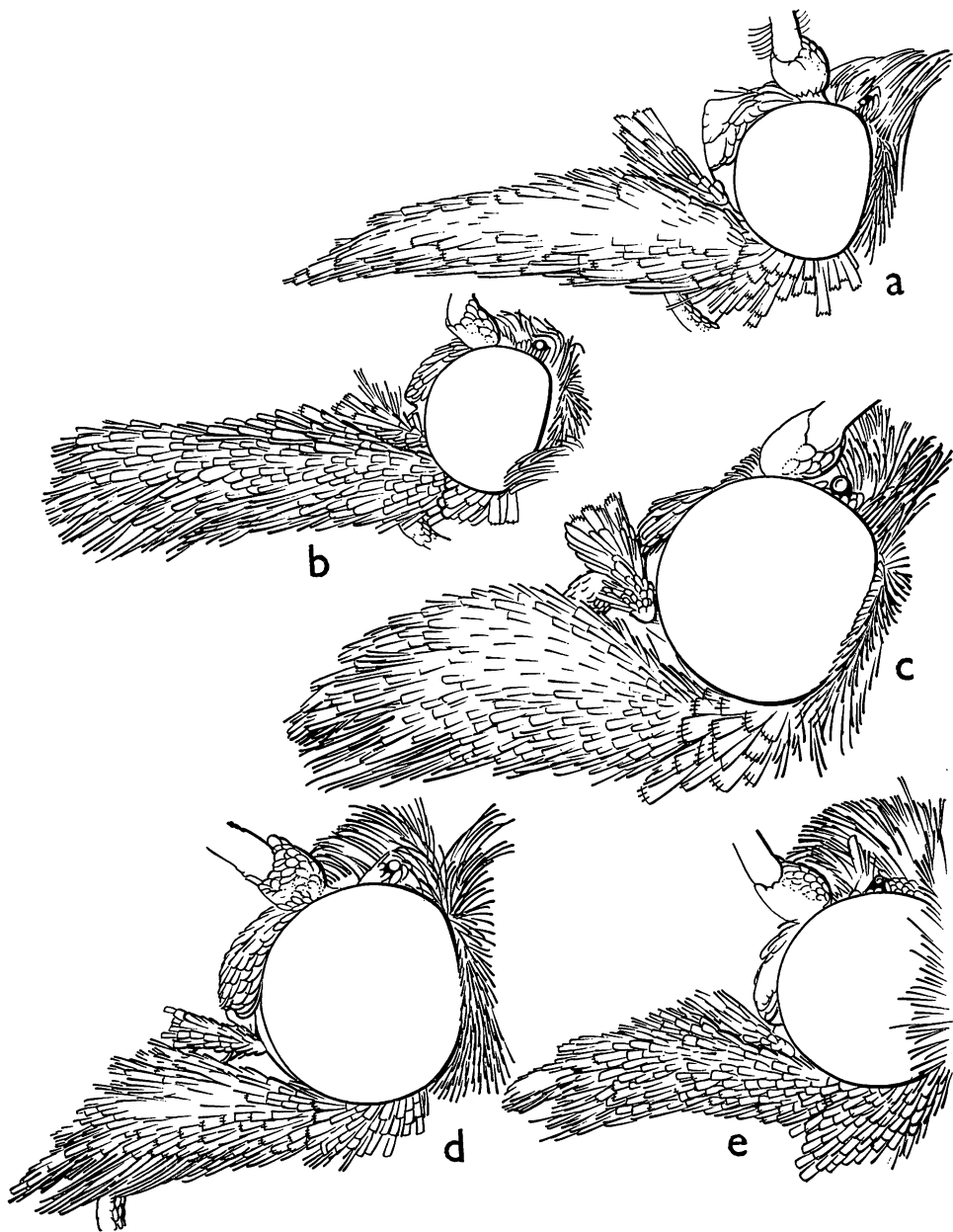


Figure 90—Heads of *Oeobia* species, illustrating variation in length and shape of the palpi and shape of the frons: **a**, *melanopis* (Meyrick); **b**, *conisalis* (Meyrick); **c**, *ennychioides* (Butler); **d**, *metasema* (Meyrick); **e**, *chytropa* (Meyrick).

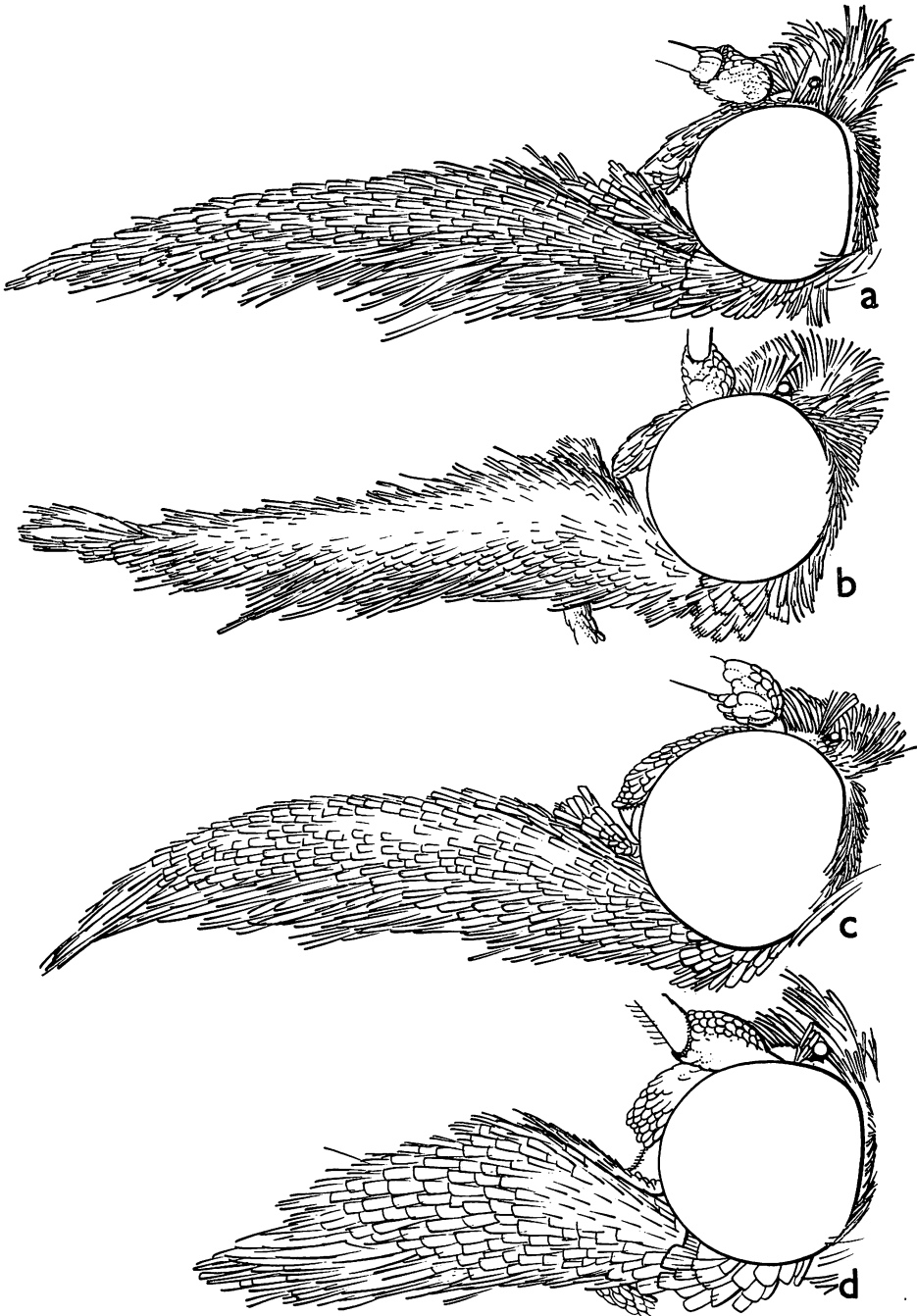


Figure 91—Heads of *Oeobia* species demonstrating variation in size of palpi and shape of frons: **a**, *helioxantha* (Meyrick); **b**, *swezeyi* (Zimmerman); **c**, *phaethontia* (Meyrick); **d**, *argoscelis* (Meyrick).

Meyrick's endemic genus *Notophytis* has heretofore been overlooked by Hawaiian entomologists, and the endemic *Melanomecyna* and *Protocolletis* have disappeared from Hawaiian literature. The merging of *Melanomecyna* to *Udea* was also overlooked in Hawaii.

When Meyrick described *Protaulacistis* he placed it after *Orthomecyna* in *Fauna Hawaiiensis*, because he said that the hind wing of the male had a "subdorsal groove above containing a loose hair-pencil." It appears that he was misled by an artificial fold on one wing of the type specimen. The wings are quite like the other species in this complex, and obviously very much different from *Orthomecyna* which belongs to the Crambinae—a different subfamily.

Meyrick erected *Notophytis* for the striking black and green *bryochloris*, but the species has nothing in its structure to justify its being separated generically from the other species of the complex.

In a large number of the species, the males have the outer spur of the submedial pair of spurs on the hind legs vestigial, and these species heretofore have been placed in *Phlyctaenia*. The type of *Phlyctaenia* Huebner, 1825, *tyres* Cramer (*thyralis*) from Borneo, is an utterly different type of pyraustid which has genitalia of the general type found in *Hedylepta* (but the aedeagus is wire-like, and there is a sort of "suprauncus" on the tegumen), and has nothing whatsoever to do with our species in the genus under discussion. The loss of the spur seems to be a random variation in the Hawaiian group, is not supported by other characters and cannot be considered as of generic value here. (In any case, is a character such as this which is found only on one sex of generic value? What is one to do with the females which do not have any supporting characters?)

Two widely dissimilar forms were placed in *Mecyna* because they were said to have the "middle tibiae of the male dilated." One of the species is shown elsewhere to be the mistakenly identified, immigrant, European *Uresiphita polygonalis*, while the other species *aurorea*, is quite typical of the Hawaiian complex. Some of our other species which have the middle tibiae about equally expanded have not been placed in *Mecyna*. Meyrick, for example, placed *metasema* in *Phlyctaenia*, but its middle tibiae are about as dilated as *aurorea*, but he did not even mention the fact.

Species which have the outer middle spur of the posterior tibia well-developed, and the middle tibiae of the male "normal" and the palpi very long and tapering were placed in *Pyrausta* Schrank, 1802 (type *cingulata*, cited by Hampson in 1896 and repeated in 1899; Duponchel listed *purpuralis* as type in 1832, but he did so in error, because Schrank included only *cingulata* and *limnalis* when he described *Pyrausta*). Of all the genera mentioned in *Fauna Hawaiiensis*, *Pyrausta* makes the nearest approach to our group, but as demonstrated by the genitalia, *Pyrausta* is distinct.

Three species were placed in *Loxostege* because the head is produced ("Face forming a horny prominence."). Meyrick placed these in *Protocolletis* in the final arrangement of his personal collection as it was received by the British Museum. Hampson placed them in *Calamochrous* in his final arrangement of the British Museum collection. This development of the head is unusual, but it appears to be

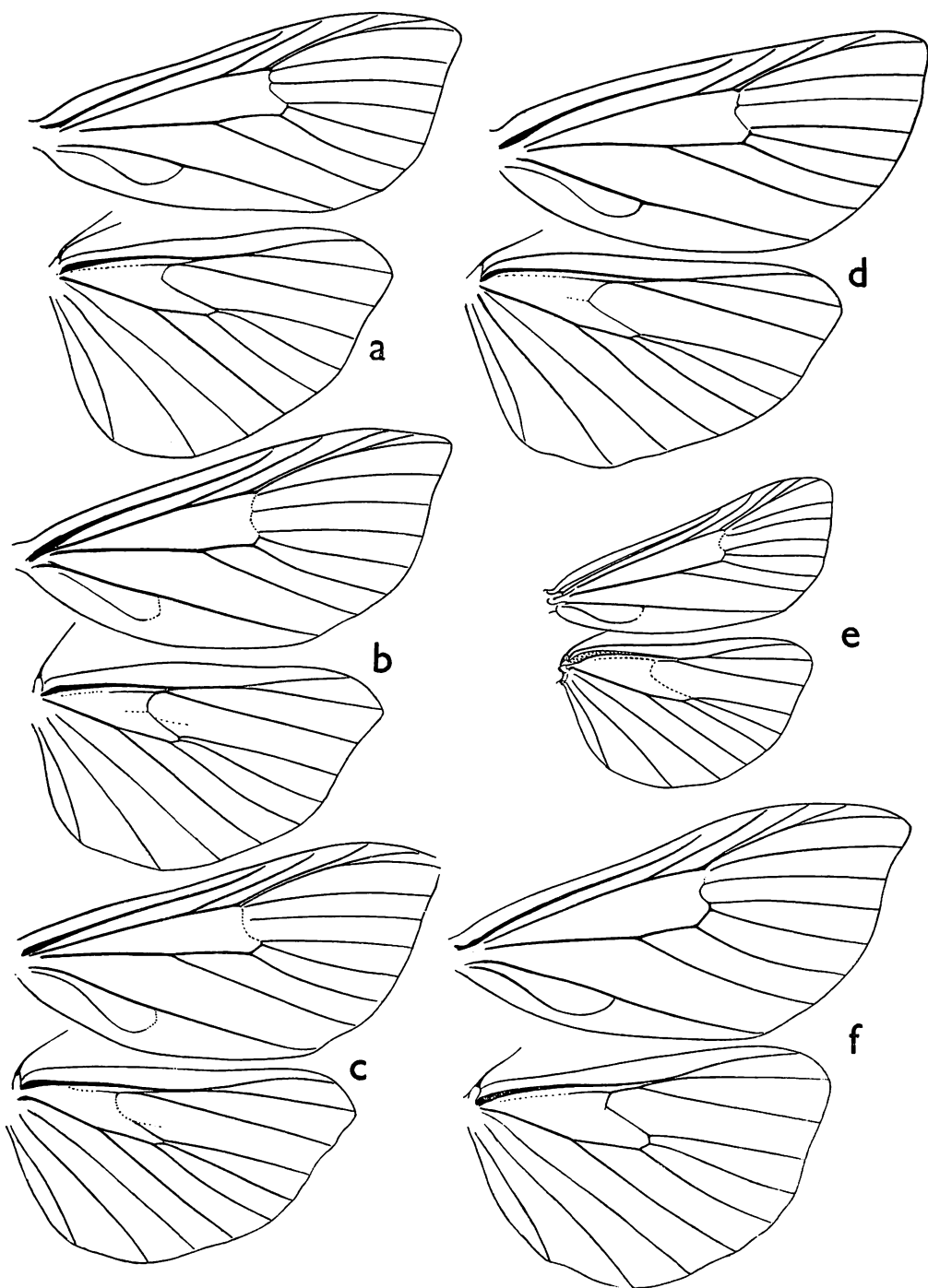


Figure 92—Wing venation of *Oeobia* species: **a**, *bryochloris* (Meyrick), formerly in *Notophytis*; **b**, *constricta* (Butler), formerly in *Pyrausta*; **c**, *despecta* (Butler), formerly in *Phlyctaenia*; **d**, *cataphaea* (Meyrick), formerly in *Protaulacistis*; **e**, *numeralis* Huebner, the type of *Oeobia*; **f**, *helioxantha* (Meyrick), formerly in *Loxostege*. Note the uniformity of the venation. Not drawn to the same scale.

only an independent endemic divergence. It is of a distinct type in one of the three species placed in *Loxostege*, and a tendency toward similar development is displayed by other species, but none except these three has reached such an extreme in development of the character. The other characters are quite typical of our group at large. The type of *Calamochrous* Lederer, 1863:387, *chilonalis* Lederer, is a Venezuelan insect with completely different genitalia, and none of our species can be assigned to that genus. Species of a host of genera have been dumped in *Calamochrous*. The type of *Loxostege*, *aeruginalis* Huebner, is, also, quite a different pyraustid.

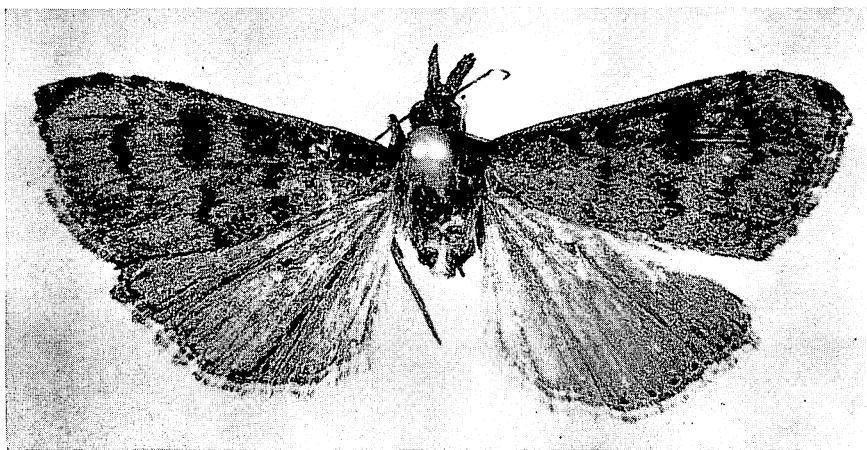


Figure 93—*Oeobia argoscelis* (Meyrick), female; Waimea Mts., Kauai, 4,000 feet; expanse, 21 mm.; genitalia figured.

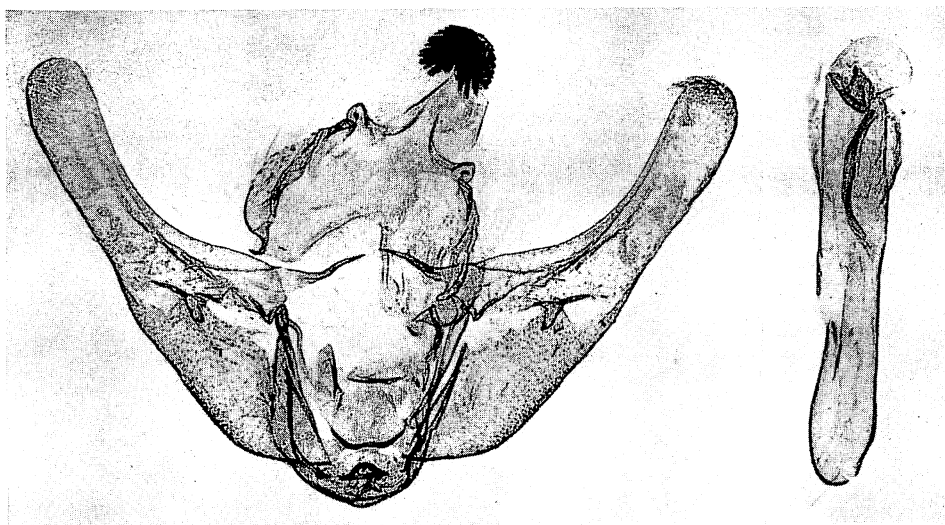


Figure 94—*Oeobia argoscelis* (Meyrick), male genitalia; Kauai.

The types of *Pionea* Guenée, in Duponchel, 1845 (*forficalis* Linnaeus, Europe, cited by Hampson, 1896:422 and 1899:247) and *Hapalia* Huebner, 1818 (*illibalis* Huebner, North America, the only originally included species) are very distinct from each other, are not congeneric as Hampson concluded, and each is quite unlike anything in Hawaii.

The only genus left from the foregoing list of genera to which our species might be assigned would appear to be the forgotten *Melanomecyna*, but Shibuya, 1928: 275, sank that name under *Udea*, a detail usually overlooked. The genus *Udea*, however, falls as a synonym of *Oeobia*, because the types are generically similar in structure. *Oeobia* has been a generally overlooked or ignored genus, but it is significant that Meyrick, in his last arrangement of his collection of pyraustids, used *Oeobia* and placed a number of the Hawaiian species under that name. The

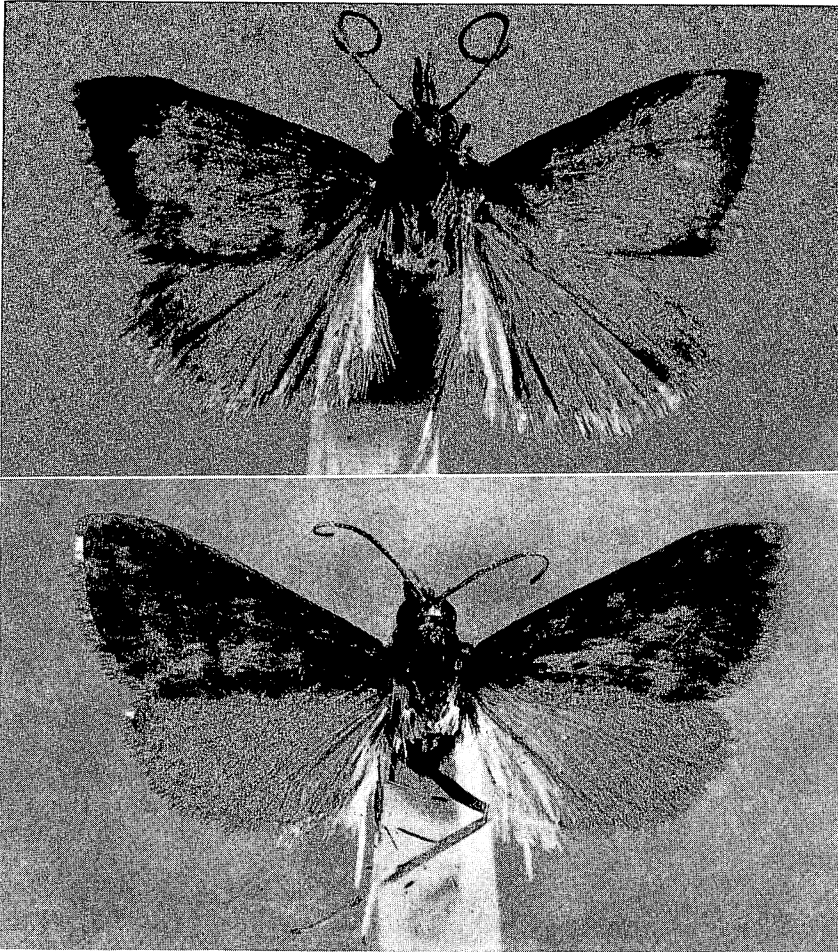


Figure 95—*Oeobia aurora* (Butler). Above: The type, "Hawaiian Islands 81-7 143" (Blackburn); expanse, 16 mm., wings bent ventrad at a strong angle. Below: A male (see figured genitalia) from Lihue, Kauai; expanse, 16 mm. These photographs are too dark.

availability of the name *Oeobia* was confused by Shibuya (1928:246) who wrongly cited the long-established type of *Hellula* as the type of *Oeobia*, thus reducing *Hellula* to a false synonym of *Oeobia* and leaving the true type of *Oeobia* without a genus. Unfortunately Klima, in *Lepidopterum Catalogus* (1939:309), followed the errors of Shibuya, thus further complicating the matter. I pointed out the error and discussed the problem in 1956 (p. 248). As noted there, the situation is as follows:

Oeobia was erected by Huebner (1825:362; 1826:59) for two species: *numeralis* Huebner, pl. 14, fig. 89, and *undalis* (Fabricius, 1781:272) Huebner, pl. 14, fig. 93 (often misspelled *undulalis*). No type was selected by Huebner. These species are not congeneric.

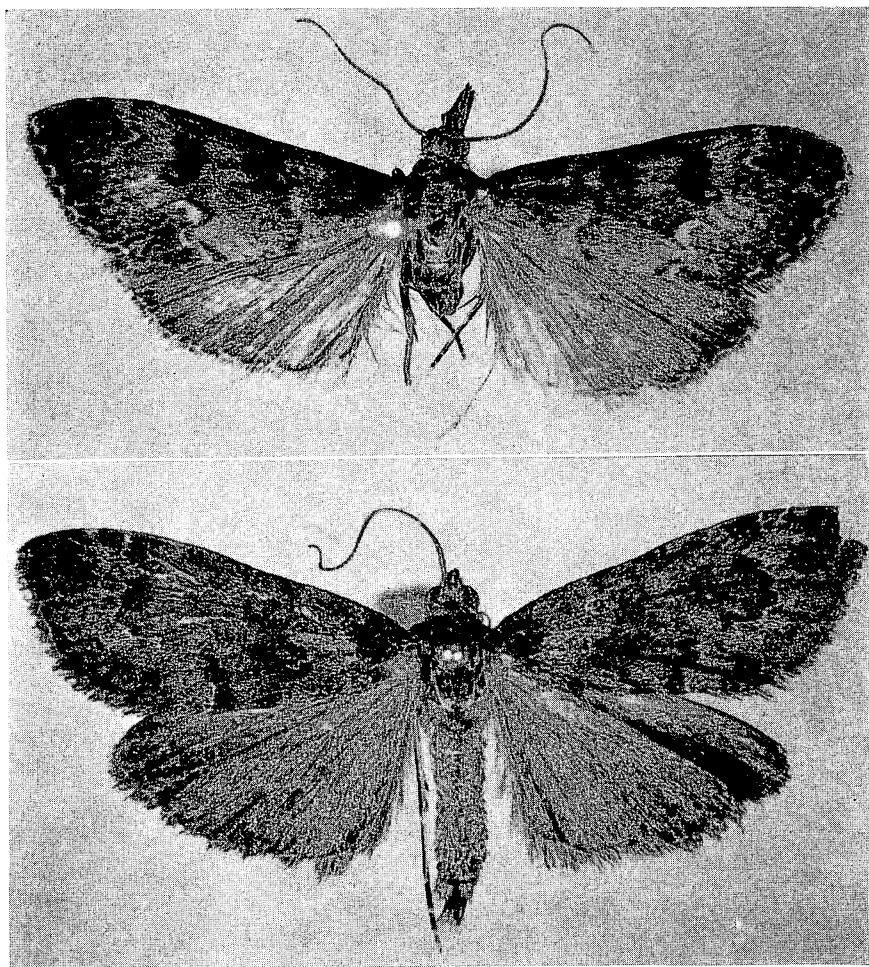


Figure 96—*Oeobia*. Above: The male type of *brontias* (Meyrick); Kaholuamano, Kauai, 4,000 feet; expanse, 24 mm. Below: The male type of *bryochloris* (Meyrick); Haleakala, Maui, 5,000 feet; expanse, 37 mm.; it is unfortunate that the beautiful green scaling of this species cannot be shown here. The genitalia of these examples are illustrated.

Hellula was erected by Guenée (1845:415) for (*Phalaena*) *undalis* Fabricius and *hydralis* Guenée (Meyrick, 1884:316, noted that he considered this to be a form of *undalis*). Guenée clearly designated *undalis* as the "Type" of *Hellula*.

Shibuya either overlooked or ignored Guenée's designation when he cited *undalis* as the type of *Oeobia*, thus making *Hellula* a false synonym of *Oeobia*. Under the nomenclatorial rules in force in 1928, Guenée's citation of *undalis* for *Hellula* leaving only the single species in *Oeobia* automatically made *numeralis* the type of *Oeobia*. Other type citations made by Shibuya are also in error. Therefore, the citation by Shibuya was an invalid citation. Further details may be found in my 1956 paper noted above.

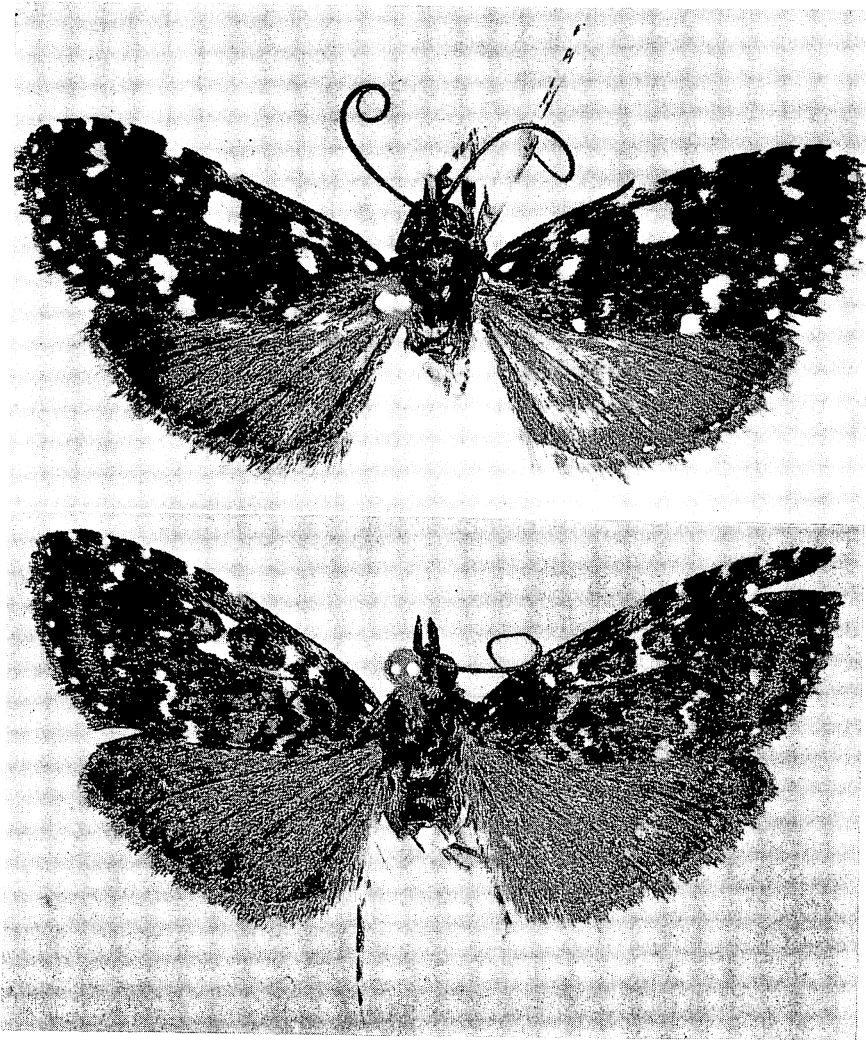


Figure 97—Above: *Oeobia calliastrea calliastrea* (Meyrick), type male; Kaholuamano, Kauai, 4,000 feet; expanse, 22 mm. Below: *calliastrea hyacinthias* (Meyrick), male type; Haleakala, Maui, over 2,000 feet; expanse, 24 mm. Genitalia figured.

The evolution of the species of this group is extremely interesting. The genus has begun to radiate in various directions, and one might select the more extreme species here and there and establish genera for them—providing that he did not know the intermediates. One would usually expect that the presence or absence of the harpe, or clasper, on the male genital valve would be of generic value. Here it is a specific character, and many of our species have lost the organ while others have retained it. It is much reduced in one species and minute in *constricta* (the type of *Protaulacistis*). Another character of great use in separating our species is whether the juxta (anellus) is toothed or simple. If we use these characters to form four categories, that is: harpe present—juxta toothed; harpe present—juxta simple; harpe absent—juxta toothed; harpe absent—juxta simple, and apply the classification to our species which are placed under *Phlyctaenia* in *Fauna Ha-*

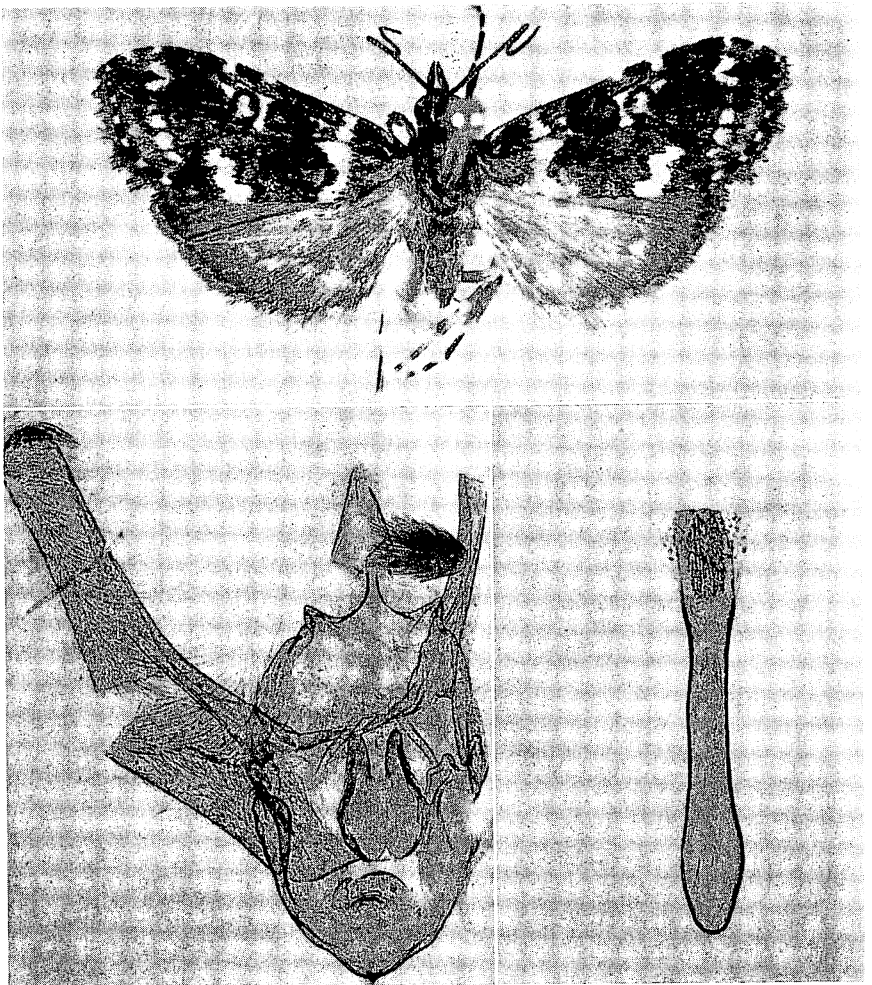


Figure 98—*Oeobia calliastrea synastra* (Meyrick), the male type and its genitalia; Kona, Hawaii, 4,000 feet; expanse, 28 mm.

waiiensis, we will find that the species may be sorted into each of the four groups. The same applies to the species placed in *Pyrausta* in *Fauna Hawaiiensis*. It is usual to find that the presence or absence of a signum on the bursa of the female is of generic value, but our series varies from species with very heavy, broad signa through narrow signa to species which have no trace of signa.

Further study may reveal that some of the females are not correctly associated with their males in our collections and literature. The antennae of the males display some differences which may be used to separate the species when more adequate materials become available for study and classification. The males may have expansile hair brushes on the middle tibiae which vary in development between the species. My key may need some alteration as the variations of the various species become known. The group of *pyranthes*, *liopis*, *endopyra*, *rhodias*, *despecta*, *aurora*, *litorea* and *constricta* may cause confusion. Some of these are closely similar and some are variable. The series of specimens and the available life history data are inadequate for the purposes of this monograph, and the group needs further examination. The species *rhodias*, *liopis* and *endopyra* are much alike.

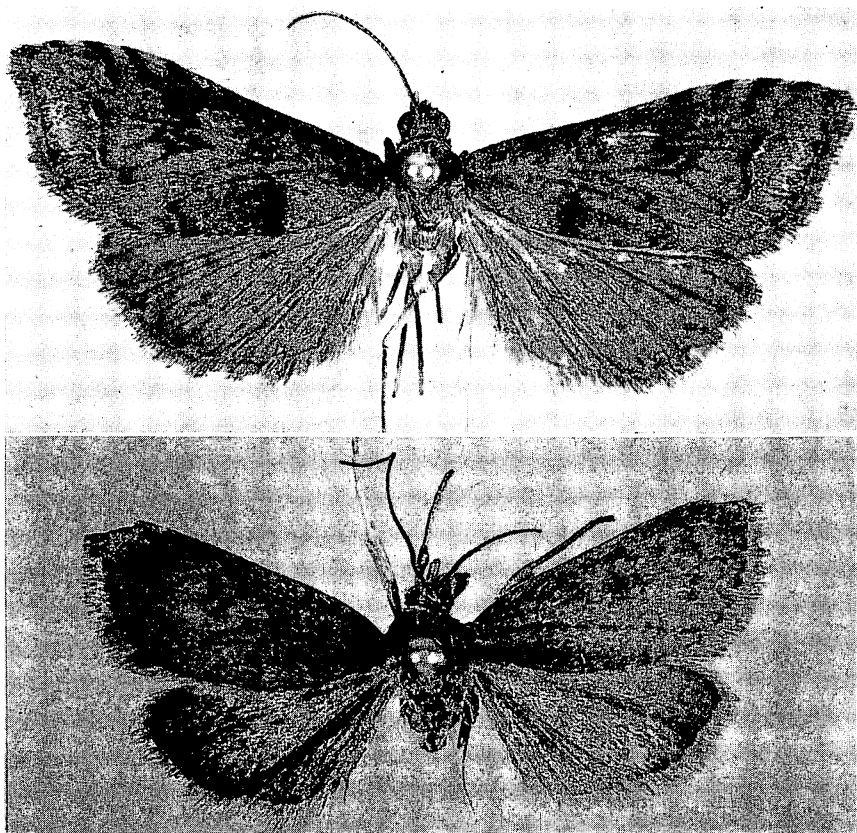


Figure 99—*Oeobia*. Above: *caminopis* (Meyrick), male; Molokai, 4,000 feet; expanse, 29 mm. Below: *cataphaea* (Meyrick), male type; Haleakala, 6,000 feet; expanse, 19 mm. Genitalia figured.

The caterpillars are leaf-rollers, or they feed beneath a web in a depression or groove in a leaf, or between spun-together leaves. The hostplants of only half the species are known, and these include the following genera of plants: *Abutilon*, *Adenostemma*, *Bidens*, *Cyrtandra*, *Dubautia*, *Hibiscus*, *Ipomoea*, *Labordea*, *Lipochaeta*, *Neraudia*, *Peperomia*, *Phyllostegia*, *Pipturus*, *Rubus*, *Rumex*, *Scaevola*, *Sida*, *Toucharidia*, *Urera*, *Vaccinium* and *Viola*. In addition, one species occasionally attacks cultivated sweetpotato and is a potential pest. It is of interest that such common and widespread trees as *Acacia*, *Metrosideros*, *Sophora*, etc. are not known to be attacked.

The endemic parasites are not well-known, but they include *Eupelmus* and *Sierola*. I have records of eight foreign wasps and one foreign fly which attack the

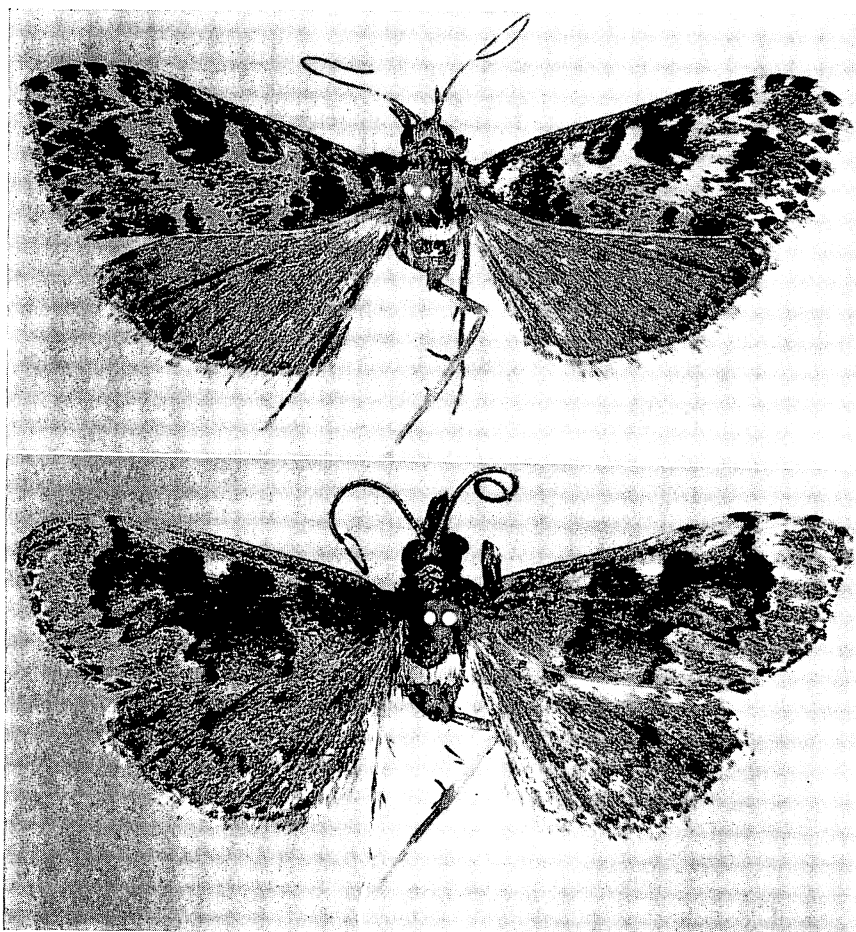


Figure 100—*Oeobia*. Above: A female paratype of *chalcophanes* (Meyrick); Oloo, Hawaii, 2,000 feet; expanse, 24 mm. Below: The male type of *chloropis* (Meyrick); Kaholuamano, Kauai, 4,000 feet; expanse, 22 mm. Genitalia figured.

larvae, but this list is incomplete. Parasitism by foreign parasites is extremely heavy, and most of the species are rarely found today, whereas they were formerly abundant; some species may be extinct.

The distribution of the species is not yet well understood. Two-thirds of the species have been recorded from two or more islands, and many have been reported to occur on several islands. Our available records are surely incomplete, but the known concentrations of the species in the islands are at present as follows:

	Number of species	Endemic to island
Kauai.....	25.....	6.....
Oahu.....	25.....	2.....
Molokai.....	16.....	0.....
Maui.....	19.....	3.....
Lanai.....	3.....	0.....
Hawaii.....	22.....	4.....

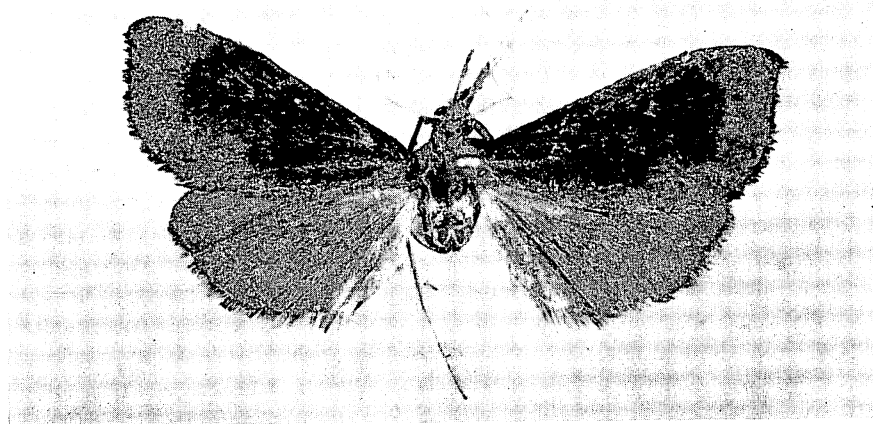
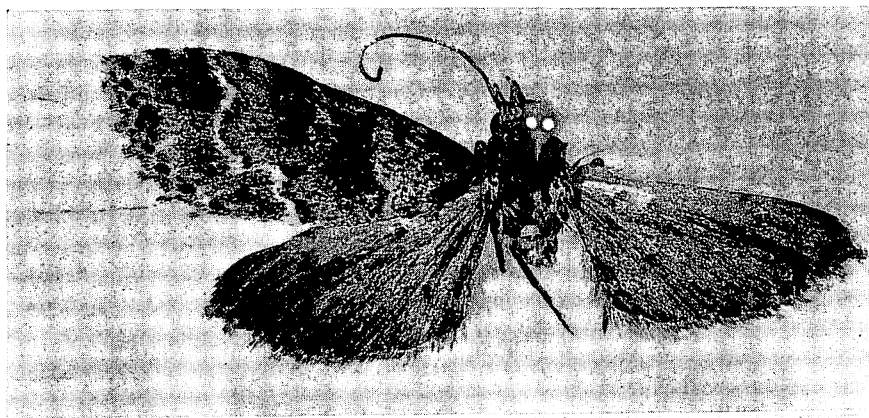


Figure 101—*Oeobia*. Above: *chytropa* (Meyrick), type female; Waimea Mts., Kauai; expanse, 22 mm. Below: Type female of *conisalis* (Meyrick); Hilo, Hawaii, 2,000 feet; expanse, 22 mm. Genitalia figured.

- as in figure 123; outer submedial spur of hind tibia of male developed **thermantoides** (Swezey).
 Not such species 9
- 9(8). Outer sides of tarsi either nearly or quite concolorous, usually pale, white, whitish or yellowish and never entirely black, or if bicolored, then dark color is reddish, never black; most species with much yellow, orange or reddish color in wings and usually with comparatively pale hind wings (exceptions: *ommatias* and *cataphaea*) 10
- Outer sides of tarsi either nearly black or distinctly bicolored, usually distinctly dark fuscous or black with pale to white markings especially at bases of segments; tibiae and femora also usually dark or black, often also bicolored; mostly dark-colored species and most with dark hind wings 21
- (NOTE: An occasional example which should run to 21 may not be fully colored and will run to 10, thus causing confusion. It may be necessary to try both sections on some examples.)
- 10(9). Hind wings almost uniformly dark fuscous above, not strongly marked, not or only a little paler than fore wings 11
- Hind wings definitely not almost uniformly dark fuscous, mostly quite pale and distinctly paler than fore wings, or both pairs of wings rather pale (as in *swezeyi*), some with considerable dark markings or darker areas 12
- 11(10). Lines on fore wings faintly indicated, postmedial line only slightly waved; reniform spot a faint dark ring; under sides of hind wings with at most small dark marks; Haleakala, Maui **cataphaea** (Meyrick).
 Lines on fore wings well defined, postmedial line strongly irregular; reniform spot white; under sides of hind wings with large dark spots; Molokai **ommatias** (Meyrick).
- 12(10). Distance from fore edge of eye to apex of palp nearly or more than one-fourth longer than breadth of head across eyes 13
- Distance from fore edge of eye to apex of palp subequal to or less than breadth of head across eyes, not longer . . . 17
- (NOTE: It is possible that some odd examples may cause confusion here. Try each section if necessary.)
- 13(12). Large straw-colored or yellow and orange species 27 to 30 mm. or more in expanse; palpi very long 14

- Less than 25 mm. in expanse.....15
- 14(13). Orange and yellow species; hind wings much paler than brownish-orange fore wings; upper surfaces with lines and spots obscure, as in figure 119; Hawaii.....
.....**phaethontia** (Meyrick).
Basically straw-colored species; fore and hind wings nearly same color; fore wings with slight purplish reflections; lines and spots well developed, as in figure 122; Kauai.....**swezeyi** (Zimmerman).
- 15(13). Fore wings suffused with orange and reddish scales, hind wings with distinct pink suffusion; anterior tarsi bicolored reddish and white; Kauai.....
.....**pyranthes** (Meyrick).
Without such a combination of characters; hind wings at least in part with some fuscous scaling.....16
- 16(15). Fore wings with at most only a small amount of orange or reddish scaling; to the unaided eyes the upper surface of insect is very pale and basically greyish-white or whitish-ochraceous; subterminal spots on both wings poorly defined, obsolescent; dark scaling beneath hind wings rather diffuse; Oahu, Lanai.....
.....**litorea** (Butler).
Fore wings with extensive orange or reddish, quite reddish to unaided eyes; both pairs of wings each with a well-defined subterminal row of black spots; under side hind wings very discretely dark-marked; Oahu.....
.....**constricta** (Butler).
- 17(12). Fore wings nearly concolorous (brownish-orange with purplish reflections), the lines obsolete, without a series of terminal dark dots; lines in hind wings obsolete; Kauai, Oahu.....**aurora** (Butler).
Fore wings with terminal series of dark dots developed and lines distinct; lines of hind wings usually distinct..18
- 18(17). Hind wings almost entirely infuscated, the dark color concealing the lines and spots; on most islands.....
.....**despecta** (Butler).
Hind wings at most infuscated outwardly and with the dark lines and spots well developed.....19
- 19(18). Postmedial line in fore wing only comparatively slightly indented and irregular in its course just behind costa, and the section which joins the costa continued nearly straight or slanting slightly distad to costa, but never bent distinctly basad from a point on or near vein 7; males usually with orbicular and reniform

- very close and separated only by a narrow vertical paler orange or yellowish bar and females with orbicular and reniform normally separated, but the space between them occupied by a paler orange spot; Oahu, Molokai, Maui, Hawaii. **endopyra** (Meyrick).
 Postmedial line in fore wing rather bent basad to costa from a point on or near vein 7. 20
- 20(19). Dark dots on costa distad of postmedial line distinct and each composed of several black scales; female genitalia as in figure 112; Maui. . **liopis liopis** (Meyrick).
 Dark dots on costa distad of postmedial line obsolete or marked by only a few scales; female genitalia as in figure 113; Molokai, Lanai. . . **liopis rhodias** (Meyrick).
 (NOTE: The character of the dotting of the costa may be worthless; there is not enough material at hand to prove its value. The one female of *liopis* dissected shows distinct differences from the two females of *rhodias* available for dissection, otherwise I should have placed all the specimens under one name. No male *rhodias* have been seen; *phyllostegia* (Swezey) may run to here.)
- 21(9). Fore wing with medial part mostly white, black and orange distad, and wing with a very distinct and unusual color pattern for the genus, as in figure 109; expanse 14 to 17 mm.; Hawaii (Kauai ?, Oahu ?, Maui ?) **eucrena** (Meyrick).
 Not so; color pattern very different. 22
- 22(21). Fore wing with antemedial line typically formed as a nearly straight, broad, subparallel-sided, transverse, pale, subbasal band, as in figure 116; (unfortunately, this is a variable species, and some atypical specimens may cause confusion); Kauai, Oahu, Maui, Hawaii **micacea** (Butler).
 Fore wings with antemedial line never so subparallel-sided and wing pattern obviously different. 23
- 23(22). Postmedial line on fore wings a broad, very bold and outstanding solid black line, antemedial line likewise broad and black; under side of fore and hind wings concolorous and with postmedial line continuous and of subequal intensity on both pairs of wings; color pattern as in figure 118; Oahu, Hawaii.
 **pachygramma** (Meyrick).
 Not so. 24

- 24(23). Fore wings basically nearly black and with numerous outstanding white spots making a characteristic pattern as in figures 97, 98 25
Without such a definite black and white pattern 27
- 25(24). Fore wings with the large discal white spot followed distad by three minute pale flecks, the pale speck nearest the white spot not distinctly larger than the others; Kauai. **calliastra calliastra** (Meyrick).
Fore wings with a moderately large whitish or yellow spot just beyond the white discal spot, this outer spot usually distinctly indenting the white discal spot, and it is followed by two minute, pale flecks as described above. 26
- 26(25). Large (24 to 27 mm.) dark examples from Haleakala, Maui; fringes of fore wings not marked with white bars, or only slightly white-spotted; Maui (and Molokai ?) **calliastra hyacinthias** (Meyrick).
Smaller (15 to 21 mm.), somewhat paler forms (especially hind wings), with fringes of fore wings strongly barred with white; Hawaii (and Oahu ?)
..... **calliastra synastra** (Meyrick).
- 27(24). Palpi measured from above from fore edge of eye to apex definitely longer than breadth of head across eyes, usually about one-fourth longer. 28
Palpi extending in front of eyes for a distance hardly greater than breadth of head across eyes, usually obviously shorter, never about one-fourth longer. 31
- 28(27). Hind wings fuscous to dark fuscous; fore wings very dark between postmedial line and termen. 29
Hind wings basically yellowish, dusted with brown or fuscous scales; fore wings usually pale distad of postmedial line, but if dark, then hind wings definitely not dark fuscous. 30
- 29(28). Fore and hind wings nearly the same dark color above; fore wings without pale scaling, the lines and spots dark, the area between antemedial and postmedial line the same color as remainder of wings; Kauai, Oahu, Molokai, Hawaii. **argoscelis** (Meyrick).
Fore and hind wings very differently colored; fore wing with considerable pale scaling, the area from about middle of wing to postmedial line clothed mostly with whitish or pale purplish scales; reniform spot a very prominent black macula surrounded by the pale scaling; Kauai. **dracontias** (Meyrick).

- 30(28). Fore wings pale between reniform spot and postmedial line, the dark area confined mainly to space across middle part of wing behind distal margin of reniform and basal margin of orbicular; palpi, head and thorax usually quite pale and at most only moderately sprinkled with dark scales; (since this key was written, I have seen a female from Oahu which has pale tarsi and which will not run here; more material is needed for study); Kauai, Oahu, Maui.
 **dryadopa** (Meyrick).
 Fore wings with the dark color continuous between antemedial and postmedial lines, except along costal margin; palpi, head and thorax conspicuously sprinkled with dark scales; Kauai, Hawaii.
 **chloropis** (Meyrick).
- 31(27). Palpi, measured from above, extending as far beyond fore edges of eyes as breadth of head across eyes.32
 Palpi distinctly shorter, extending beyond eyes for a distance only about three-fourths the breadth of head across eyes, often not longer than breadth of interocular space plus breadth of one eye.34
- 32(21). Under side hind wing with postmedial line broken up into a series of prominent dark spots, the wing prominently spotted; (outer medial spur of hind tibia of male vestigial); Hawaii. **metasema** (Meyrick).
 Under side hind wing with postmedial line subcontinuous and not broken up into a series of dots, the wing not appearing conspicuously spotted; (outer medial spur of hind tibia vestigial or developed).33
- 33(32). Fore wings with rather strong purplish reflections, hind margin usually yellowish from base to antemedial line; hind wings rather dark fuscous, the postmedial line not traceable above; (outer medial spur on hind tibia vestigial in male); Kauai. **brontias** (Meyrick).
 Fore wings not purplish, at most with slight bronzy reflections; hind wings whitish-fuscous, postmedial line weak but traceable above; (outer medial spur on hind tibia about half as long as inner spur in male); Maui, Hawaii. **lampadias** (Meyrick).
- 34(31). Expanse 29 to 30 mm.; fore wing with orbicular and reniform spots not developed on lower surface, costa bright orange beneath, and at least with dashes of orange beyond middle on upper side, or entire costa narrowly orange; postmedial line of characteristic

- pattern as in figure 99, the wing dusted distad of the line with purplish-white scales; Molokai.
**caminopis** (Meyrick).
 Smaller species, usually less than 25 mm. in expanse;
 orbicular and reniform spots usually strongly developed beneath fore wings.35
- 35 (34). Upper surfaces of both pairs of wings very dark and without any extensive pale scaling or pale blotches. . . .36
 Upper surfaces always with pale blotches or extensive pale scaling.37
- 36 (35). Fore wing with outer margin of postmedial line with a narrow edging of yellowish scales which appears almost or quite continuous and is not represented by only isolated flecks; Kauai, Oahu, Maui.
**ennychioides** (Butler).
 Outer edging of postmedial line of fore wings marked at most by a series of disconnected whitish flecks; Kauai, Oahu, Molokai.**stellata** (Butler).
 (NOTE: These characters may not be constant and further study is essential to clarify the situation. See the differences in male genitalia, as illustrated.)
- 37 (36). Expanse 13 to 18 mm. (in a series of 21 examples measured, most were smaller than 17 mm.); antemedial and postmedial lines usually boldly developed black bands on posterior half of wing; Kauai, Oahu, Molokai, Maui, Hawaii.**nigrescens** (Butler).
 Expanse usually (but not always) distinctly more than 20 mm.; fore wing color pattern distinct from figure of *nigrescens*.38
- 38 (37). Postmedial line appearing to continue directly across fore wing from hind margin along distal margin of reniform spot to costa, the area between the reniform spot and the true outer course of the obscure postmedial line forming a variable, large, pale blotch, as in figure 108 (since the key was written, I have examined an Oahu example which has the postmedial line better defined outwardly, and it does not appear to run so distinctly to the outer side of the reniform spot as described here; the wing pattern is, however, quite distinct from the next few species, and it can be determined from the illustration); Kauai, Oahu, Molokai, Maui.**ephippias** (Meyrick).
 Fore wings not so; postmedial line obviously irregular and continued distinctly to costa far distad of reni-

- form spot; with or without a large pale patch beyond reniform spot. 39
- 39 (38). Antemedial line of fore wing appearing to slant strongly across wing from costa obliquely distad to hind margin. 40
- Antemedial line of fore wing not strongly oblique, but placed at right angles to longitudinal axis of wing, more nearly straightly crossing wing. 42
- 40 (39). Base of fore wing with a large, conspicuous, black patch, widest along costa, extending backward as a triangular patch, the apex of which continues as a line to posterior margin of wing and encloses a smaller pale area just inside posterior margin; wing pattern as in figure 117; a variable species; Kauai, Oahu, Hawaii. **monticolans** (Butler).
- Base of fore wing with only a black costal spot which does not extend to hind margin; color pattern of fore wings distinctive, with a broad, antemedial, dark fascia followed by pale scaling which extends from costa to posterior margin as in figures of *platyleuca* and *violae*. 41
- 41 (40). Reniform spot on fore wing only slightly oblique, its axis nearly at right angles to costa and the posterior part of the postmedial line (that is, the section which arises from the hind margin of the wing) directed to its posterior basal corner; wing pattern as in figure 120; Oahu, Molokai, Maui, Hawaii.
- **platyleuca** (Meyrick).
- Reniform spot on fore wing strongly oblique, its axis obviously at a distinct angle from costa, and the posterior part of the postmedial line directed toward costa (but, of course, not passing middle of wing) at a point distinctly basad of the posterior end of the spot; wing pattern as in figure 124; Oahu.
- **violae** (Swezey).
- 42 (39). Postmedial line in fore wing acutely notched just behind costa as in figure 123; outer medial spur on hind tibia of male developed; Kauai, Oahu, Molokai, Maui, Hawaii. **thermantis** (Meyrick).
- Postmedial line in fore wing broadly bent distad to costa to form an obtuse angle as in figure 101; outer medial spur on hind tibia of male vestigial; Kauai, Oahu. **chytropa** (Meyrick).

***Oeobia argoscelis* (Meyrick), new combination** (figs. 91, 93, 94, 143).

Scopula argoscelis Meyrick, 1888:222.

Phlyctaenia argoscelis (Meyrick) Meyrick, 1899:217.

Endemic. Kauai, Oahu (type locality ?), Molokai, Hawaii.

Hostplant: *Rumex giganteus*.

Parasite: *Casinaria infesta* (Cresson).

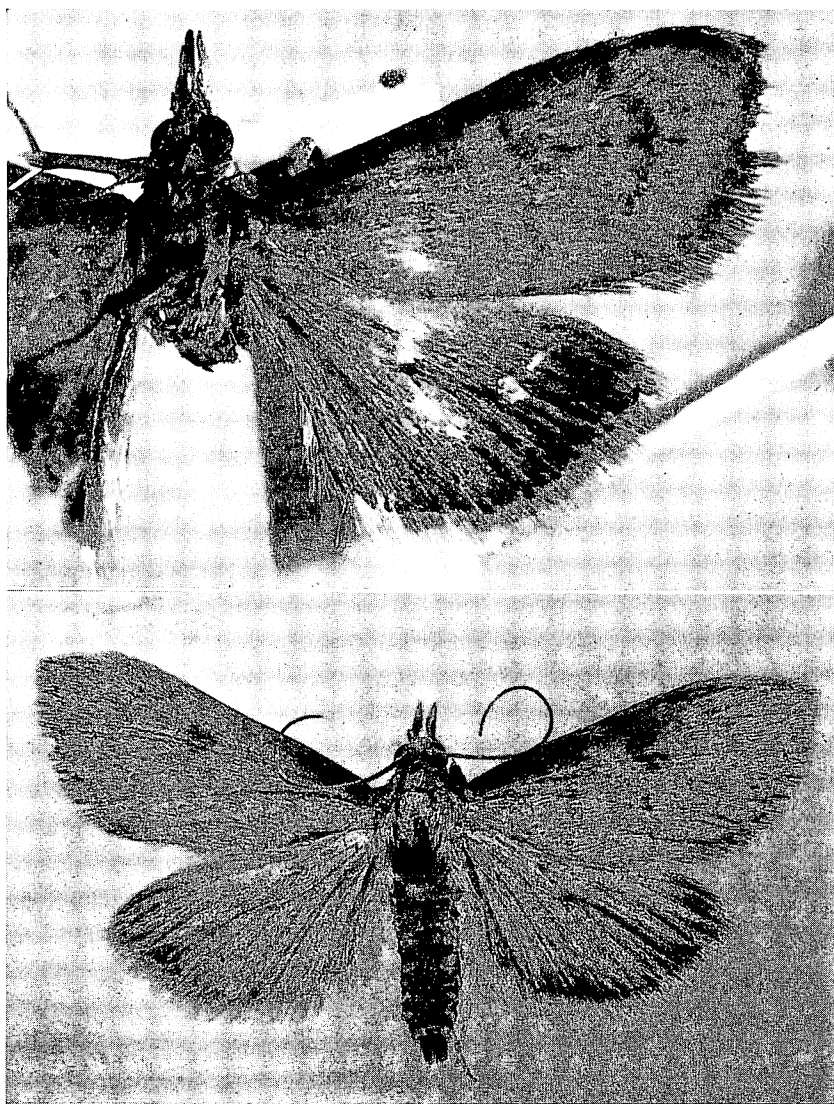


Figure 103—*Oeobia despecta* (Butler). Above: The female type; wing, 8.5 mm. long; "77-43 Sandw. Islands L-27" (Blackburn); genitalia illustrated. Below: A specimen of the synonym *campylothecae* Swezey; reared from *Campylotheca*; Mt. Olympus, Oahu; fore wing length, 9.5 mm.

The two examples collected by Blackburn and in the Meyrick collection at the British Museum are labeled simply "Hawaiian Is. TB/81." No type was designated. I have chosen a male with its abdomen intact as lectotype.

***Oeobia aurora* (Butler), new combination** (figs. 95, 125).

Anemosa aurora Butler, 1881:327.

Mecyna aurora (Butler) Meyrick, 1888:225; 1899:225, pl. 6, fig. 6; 1904:133.

Pionea aurora (Butler) Hampson, 1899:246.

Endemic. Kauai, Oahu (type locality).

Hostplants: *Bidens* species.

Parasite: *Angitia blackburni* (Cameron).

Predator: *Odynerus nigripennis* (Holmgren).

There are three examples in the British Museum; the male type and a female have no locality labels; the second male was collected by Perkins at Lihue, Kauai, in 1892. The type has a terminal series of dark dots on the hind wings, but on the other male and the female these dots are obsolete. Meyrick placed this species in *Oeobia* in his collection, and Hampson put it in *Hapalia* in his final arrangement of the British Museum collection.

Dr. Swezey has told me that he has found the caterpillars feeding between spun-together leaves, that the pupa is about 10 mm. long, wing- and leg-sheaths extend onto the fifth abdominal segment, the spiracles on segments 3 to 8 are at the apices of round tubercles, and the cremaster is somewhat produced and has about six hooked spines at the apex.

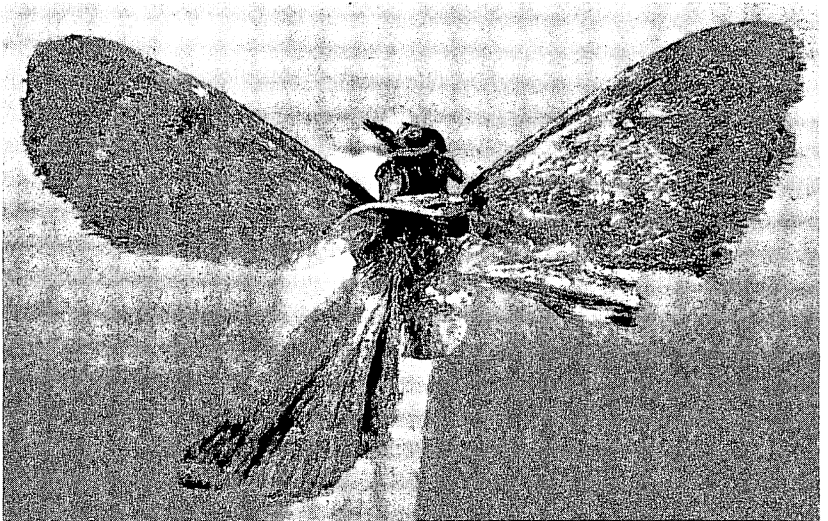


Figure 104—*Oeobia despecta* (Butler); from the type of the synonym *exigua* Butler; "Maui 80-31 (27)" (Blackburn).

***Oeobia brontias* (Meyrick), new combination** (figs. 96, 126, 144).

Pyrausta brontias Meyrick, 1899:223.

Endemic. Kauai (type locality: Kaholuamano, 4,000 feet).

Hostplant: Unknown.

Meyrick placed this species in *Oeobia* in the final arrangement of his personal collection.

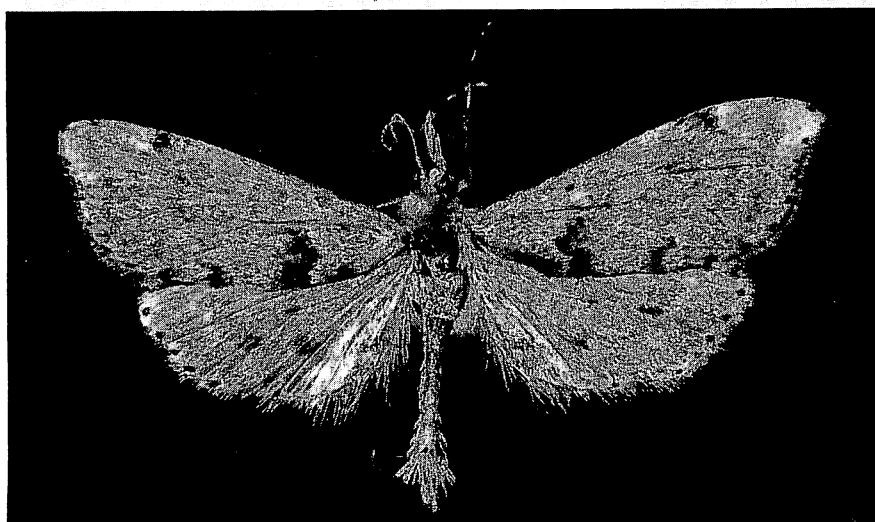
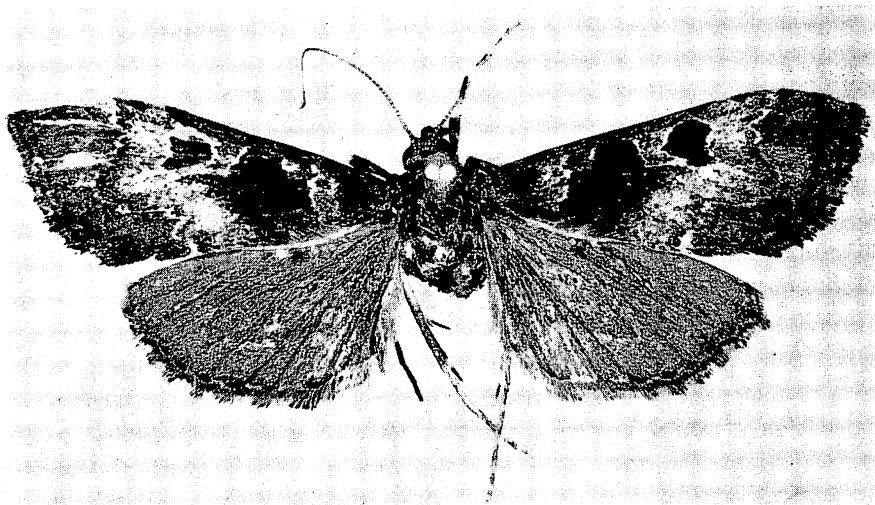


Figure 105—*Oeobia*. Above: The type of *dracontias* (Meyrick); Waimea Mts., Kauai, 4,000 feet; expanse, 26.5 mm. Below: The male type of *dryadopa* (Meyrick); Haleakala, Maui, 5,000 feet; expanse, 20 mm.; genitalia figured.

Oeobia bryochloris (Meyrick), **new combination** (figs. 92, 96, 126, 145).

Pyrausta bryochloris Meyrick, 1899:223, pl. 6, fig. 1.

Notophytis bryochloris (Meyrick) Meyrick, 1932:318. Type of *Notophytis*.

Endemic. Maui (type locality: Haleakala, 5,000 feet).

Hostplant: Unknown.

As noted above, Meyrick's monotypic genus *Notophytis* erected for this beautiful black and green species has been overlooked by Hawaiian entomologists.

Oeobia calliastra calliastra (Meyrick), **new combination** (figs. 97, 127, 145).

Phlyctaenia calliastra Meyrick, 1899:207, pl. 5, fig. 22.

Endemic. Kauai (type locality: Kaholuamano, 4,000 feet).

Hostplant: Unknown. Swezey's record of breeding this form from *Peperomia membranacea* (1910:136) is in error and applies to *synastra*.

My study of the type series of this form and *hyacinthias* and *synastra* convinced me that they are perhaps best considered as subspecies. The Kauai form, *calliastra*

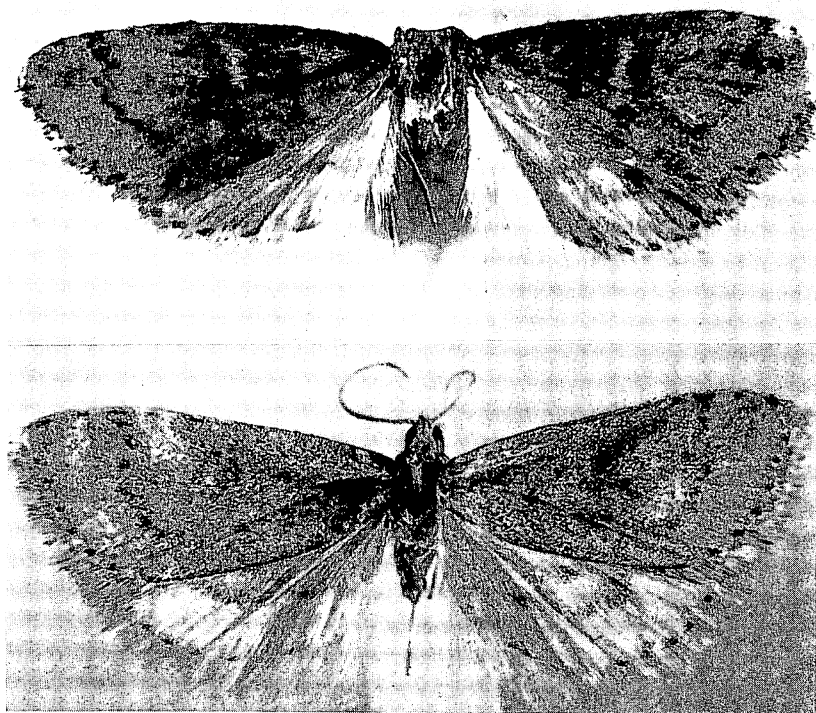


Figure 106—*Oeobia*. Above: The male type of *endopyra* (Meyrick); Hilo, Hawaii, 2,000 feet; expanse, 15 mm.; genitalia figured; the photograph is too dark. Below: Another example; Haleakala, Maui, 5,000 feet.

calliastra, is most distinct in both genitalia and external characters. It might be considered a full species, with *synastra* as a subspecies of *hyacinthias*. This is an interesting complex which deserves more study.

***Oeobia calliastra hyacinthias* (Meyrick), new combination, new status**
(figs. 97, 127, 147).

Phlyctaenia hyacinthias Meyrick, 1899:208.

Endemic. Molokai ?, Maui (type locality: Haleakala, 5,000 feet).

Hostplant: Unknown.

I have not examined Swezey's specimens recorded under this name from Molokai, and they may or may not be typical *hyacinthias*.

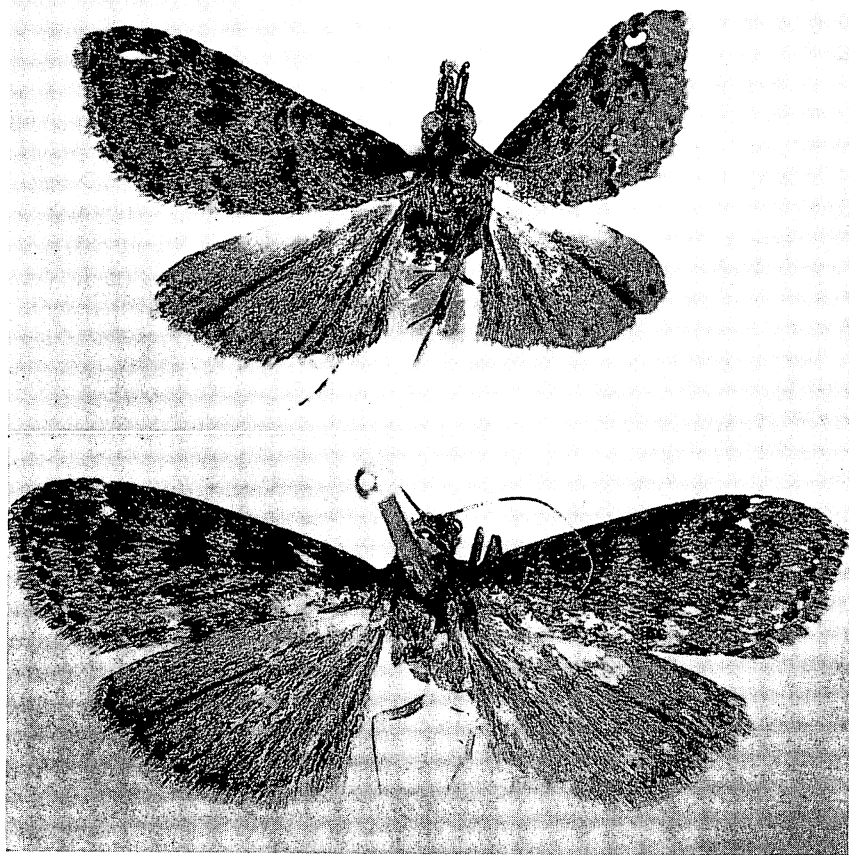


Figure 107—*Oeobia ennychioides* (Butler). Above: The male type; "Hawaiian Isds. 81-7 135"; expanse as mounted, 17 mm., but wings drooping and true expanse about 20 mm. Below: A female from the Molokai Mts.; expanse, 21.5 mm. Genitalia of these examples figured.

Oeobia calliastra synastra (Meyrick), new combination, new status (figs. 98, 148).

Phlyctaenia synastra Meyrick, 1899:208.

Endemic. Oahu ?, Molokai ?, Hawaii (type locality: Kona, 4,000 feet).

Hostplants: *Peperomia latifolia*, *Peperomia membranacea*.

I have not examined adequate material from Oahu to determine whether the Oahu form is true *synastra*. Likewise, I am uncertain of the Molokai record (based upon Meyrick's 1900:258 recording of one example collected on Molokai by Schauinsland). The hostplant data apply to Oahu examples reared by Swezey.

Oeobia caminopis (Meyrick), new combination (figs. 99, 128, 149).

Phlyctaenia caminopis Meyrick, 1899:215; 1904:133.

Endemic. Oahu, Molokai (type locality: 5,000 feet), Hawaii.

Hostplant: *Labordea*.

Dr. Swezey has given me the following notes on the larva: Head testaceous and a round black spot in front in center of each lobe, above these black spots are two oblique bars near the medial line; eyes black, and a wide dark brown line extending above them to the top of the head; prothoracic shield with a large black spot near each lateral margin; remaining segments without markings.

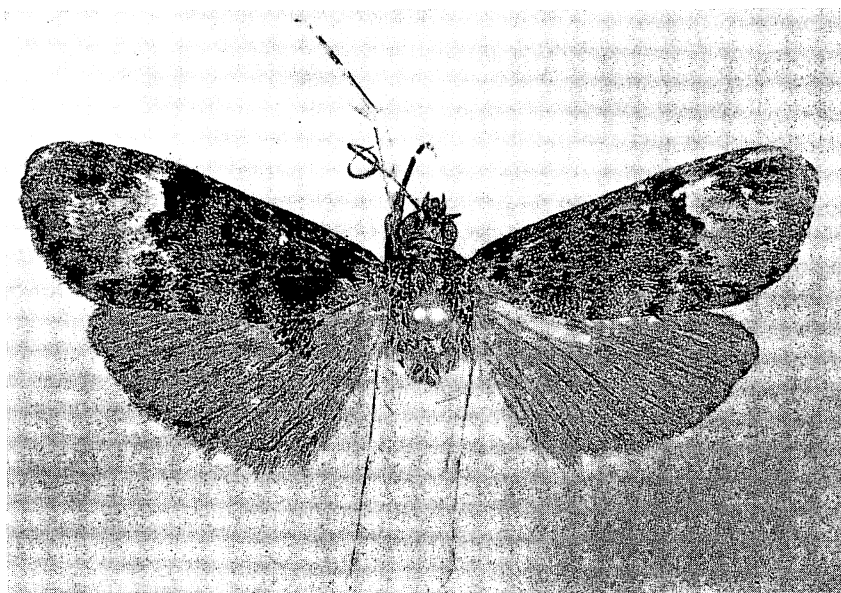


Figure 108—The male type of *Oeobia ephippias* (Meyrick); Waimea Mts., Kauai, 4,000 feet; expanse, 22 mm. Note the exposed cluster of specialized scales beyond the base of the posterior edge of the left fore wing. Genitalia illustrated.

***Oeobia cataphaea* (Meyrick), new combination** (figs. 92, 99, 128, 150).

Protaulacistis cataphaea Meyrick, 1899:246, pl. 7, fig. 2. Type of *Protaulacistis*.

Endemic. Maui (type locality: Haleakala, 6,000 feet).

Hostplant: Unknown.

Meyrick was misled by an artificial fold in one wing of the type when he stated that the male "has the subdorsal groove" as in *Orthomecyna*, and thus placed the species far from its true associates. Hampson placed the species in *Hapalia* in the British Museum collection.

***Oeobia chalcophanes* (Meyrick), new combination** (figs. 100, 129, 151).

Phlyctaenia chalcophanes Meyrick, 1899:209, pl. 5, fig. 23.

Endemic. Oahu, Maui, Hawaii (type locality: Olaa, 2,000 feet).

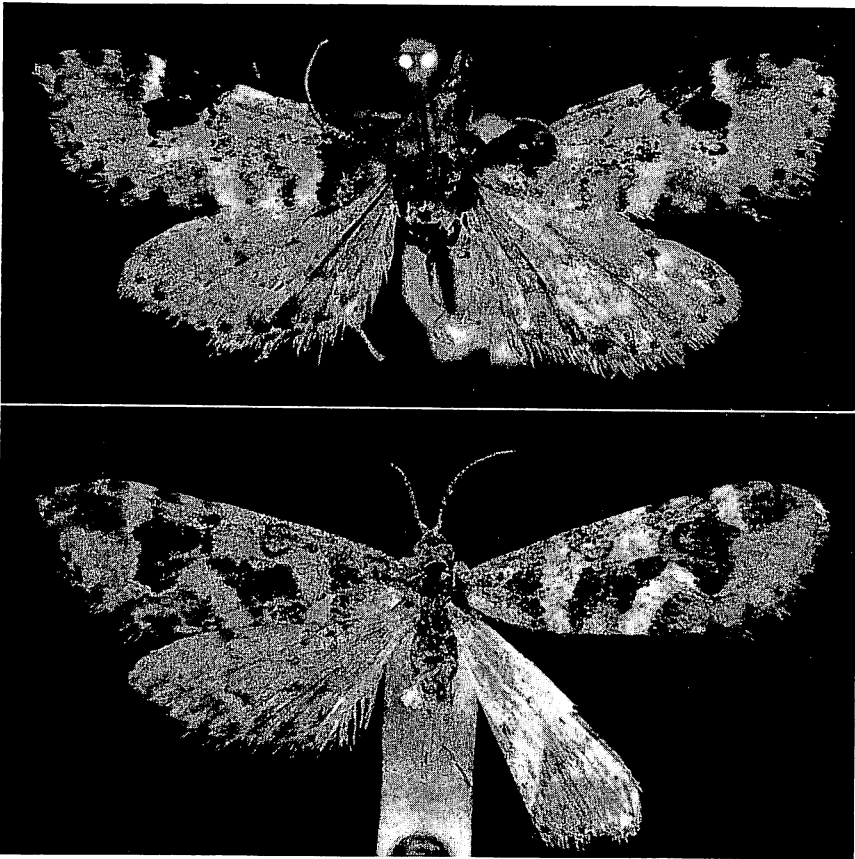


Figure 109—*Oeobia eucrena* (Meyrick). Above: A specimen from Olaa, Hawaii; expanse, 16 mm. Below: The female type of the synonym *Pionea leucozonea* Hampson; Kilauea, Hawaii; expanse, 15.5 mm.; genitalia illustrated.

Hostplant: *Touchardia latifolia* leaves.

Parasite: *Zaleptopygus flavo-orbitalis* (Cameron).

Dr. Swezey told me that the caterpillar has the testaceous head checkered with brownish above the black eyespot, and there is a longitudinal black mark near each lateral margin of the prothoracic shield.

Oeobia chloropis (Meyrick), **new combination** (figs. 100, 129, 152).

Pyrausta chloropis Meyrick, 1899:222.

Endemic. Kauai (type locality: Kaholuamano, 4,000 feet), Hawaii.

Hostplant: Unknown.

Meyrick placed this in *Protocolletis* in the final arrangement of his personal collection.

Oeobia chytropa (Meyrick), **new combination** (figs. 90, 101, 153).

Phlyctaenia chytropa Meyrick, 1899:210. Swezey, 1954:106.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet), Oahu.

Hostplant: Native *Hibiscus*.

Parasite: *Pristomerus hawaiiensis* Perkins.

Dr. Swezey told me that the green caterpillar has black eyes, there are four to twelve black marks on the head, and the prothoracic shield has a longitudinal black mark near each lateral margin; they feed between webbed leaves of the hostplant.

Oeobia conisalias (Meyrick), **new combination** (figs. 90, 101, 154).

Loxostege conisalias Meyrick, 1899:226.

Endemic. Hawaii (type locality: Hilo, 2,000 feet).

Hostplant: Unknown.

Meyrick (1904:133) recorded this species from Molokai and Oahu, but he misidentified the specimens. I have examined the original series of three specimens from Hilo and the specimens from Molokai and Oahu in the British Museum collection and in Meyrick's collection. In the British Museum set of the *Fauna Hawaiiensis* material is the holotype female from Hilo, one male from the north-west Koolau Mountains of Oahu, and one male from Molokai. The males are not the same species as the female. The males have the lines on the fore wings more distinct, and their hind wings have definite dark lines on a paler background. The female type has the fore wings more solidly dark inside the lines which are not distinct, and the hind wings are darker and lack the lines. An examination of a male from Hilo in Meyrick's collection proves that the two males mentioned above from Oahu and Molokai are different. The male genitalia of *conisalias* are very similar to those of *melanopis*; see the notes under *melanopis*. Meyrick put

this species in *Protocolletis* in his collection. Hampson placed it in *Calamochrous* in the British Museum cabinet.

***Oeobia constricta* (Butler), new combination** (figs. 92, 102, 155).

Scopula constricta Butler, 1882:40.

Protocolletis constricta (Butler) Meyrick, 1888:224. Type of *Protocolletis*.

Pyrausta (*Protocolletis*) *constricta* (Butler) Meyrick, 1899:224.

Pyrausta constricta (Butler) Meyrick, 1904:360. Swezey, 1954:189.

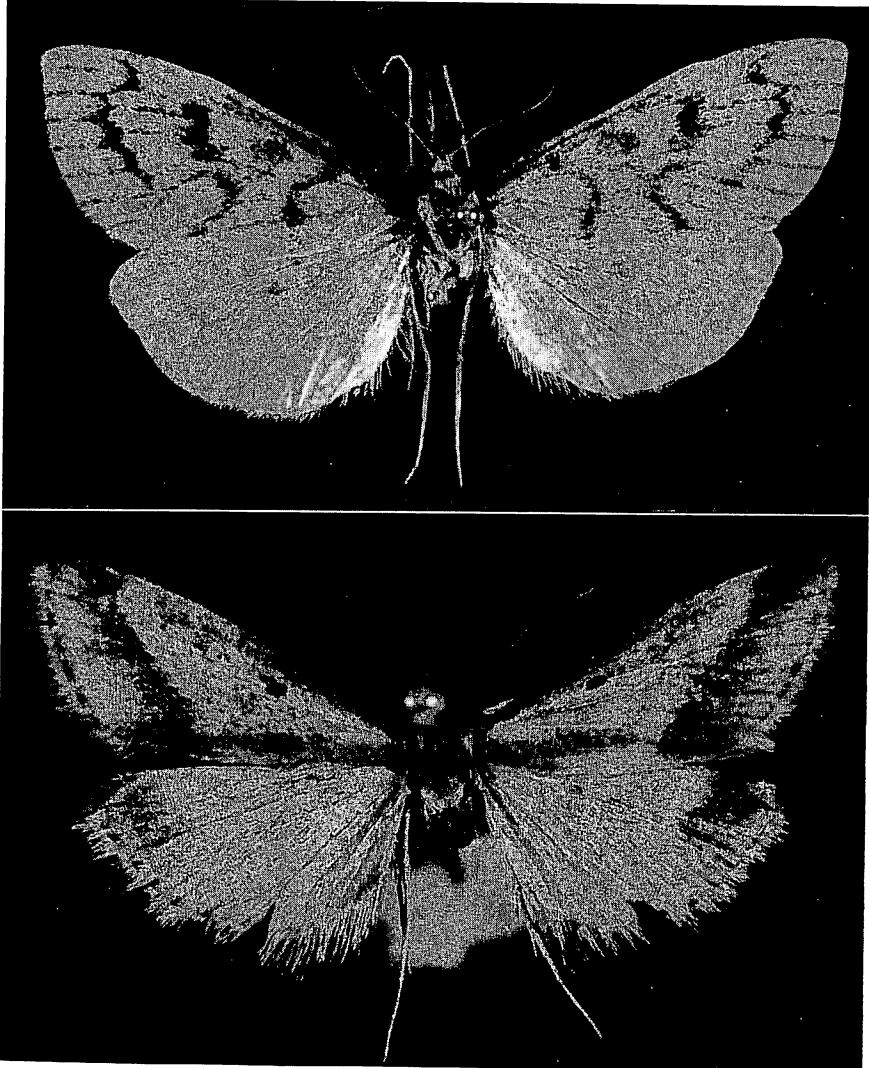


Figure 110—*Oeobia*. Above: *helioxantha* (Meyrick), female paratype; Kaholuamano, Kauai, 4,000 feet; expanse, 31 mm. Below: The type of *heterodoxa* (Meyrick); Haleakala, Maui, 5,000 feet; expanse, 17 mm.; the wings are not horizontal but are mounted at steep angles, and the photograph is rather poor. The genitalia of these examples are illustrated.

Endemic. Kauai, Oahu (type locality: mountains near Honolulu), Molokai.

Hostplants: *Scaevola chamisoniana*, *Scaevola gaudichaudii*, *Scaevola mollis*, *Scaevola* species.

Parasite: *Angitia blackburni* (Cameron).

This species is closely allied to *litorea*. Dr. Swezey told me that the caterpillar has a testaceous head, somewhat mottled with pale brown; eyes black; body segments without distinctive markings.

Meyrick left this species in *Protocolletis* in his personal collection, and Hampson also placed it there in his final arrangement of the British Museum collection.

***Oeobia despecta* (Butler), new combination** (figs. 92, 103, 104, 130, 156, 157).

Rhodaria despecta Butler, 1877:49.

Scopula exigua Butler, 1880:9 (described from Maui). Synonymy by Meyrick, 1888:223.

Scopula despecta (Butler) Meyrick, 1888:223.

Pionea despecta (Butler) Hampson, 1899:248.

Phlyctaenia despecta (Butler) Meyrick, 1899:217; 1904:360. Fullaway, 1911:19, fig. 7, biology.

Phlyctaenia campylothea Swezey, 1946:625. **New synonym.**

The Hawaiian sweetpotato leafroller.

Endemic. Kauai, Oahu (type locality: Honolulu ?), Molokai, Maui, Lanai, Hawaii.

Hostplants: *Adenostomma viscosus*, *Bidens* (*Campylothea*), *Bidens cosmoides*, *Ipomoea* species, *Lipochaeta calycosa*, sweetpotato.

Parasites: *Angitia blackburni* (Cameron), *Chelonus blackburni* (Cameron).

Fullaway (1911:19) and Chung (1923:12) have reported this species as being a minor sweetpotato leafroller pest.

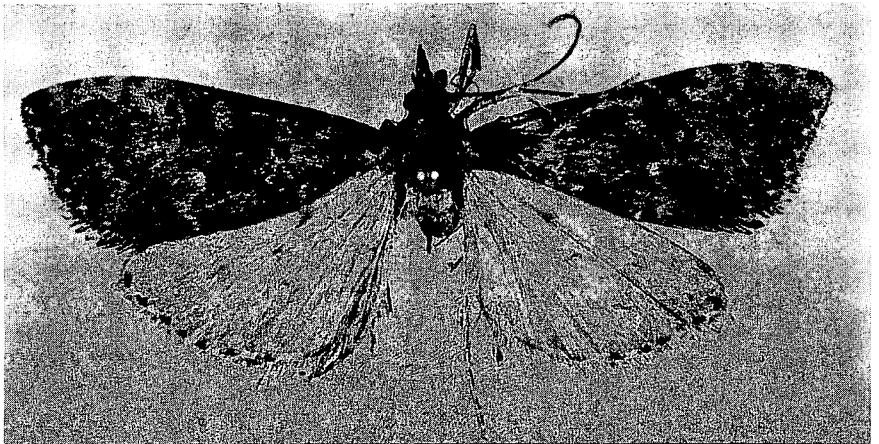


Figure 111—*Oeobia lampadias* (Meyrick), lectotype female; Kilauea, Hawaii; genitalia figured.

My studies have led me to agree with Meyrick in considering this species to be a variable one. Dr. Swezey believes that more than one species is involved, and he does not agree with my sinking of his *campylothea*, because he has found color pattern differences in the larvae. I have been unable to find evidence from my study of the genitalia and the large series of specimens available to enable the series to be sorted into clear-cut forms. The material shows gradation in size and in color and pattern. Freshly caught specimens often appear distinct from old, faded ones. It is possible, however, that I am in error, and further study of the problem is needed.

Dr. Swezey has given me some notes on larvae he has examined. Caterpillars reared from *Ipomoea*, and considered to be *despecta* by Swezey, are said to have the head pale testaceous with black eyes and no other distinctive marks, and the prothoracic shield and body segments lack distinctive marks. The larva of his *campylothea* are said to have the head pale testaceous with two pairs of roundish

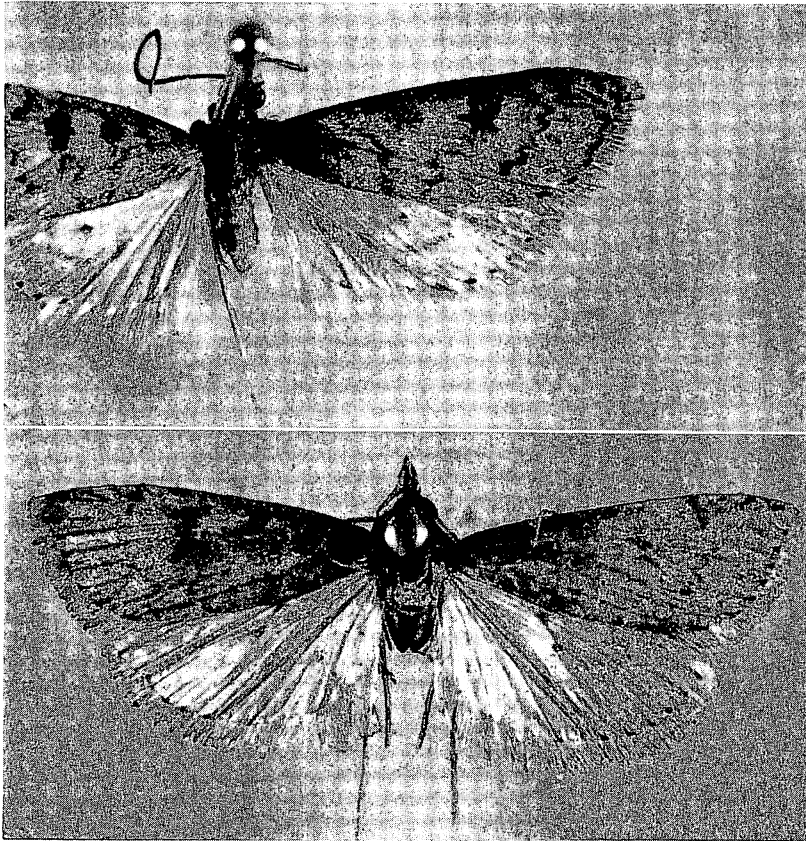


Figure 112—*Oeobia liopis* (Meyrick). Above: The male type; Haleakala, Maui, 6,000 feet; expanse of right wing, 11 mm. Below: A female from the same locality, 5,000 feet; expanse, 21 mm.; genitalia figured.

black spots in front, the upper pair closer together and near the top of the head; eyes black; prothoracic shield with a small dot toward each lateral margin; the other body segments without distinctive markings. Dr. Swezey feels that material reared from *Lipochaeta* perhaps is a third species, because he found that the caterpillars have testaceous heads, a roundish dark spot in front near the middle of each lobe; eyes black; a small black bar near each lateral margin of the prothoracic shield and no distinctive markings on the other body segments. Blackburn (1882:56) gave a description of larvae he considered to be this species.

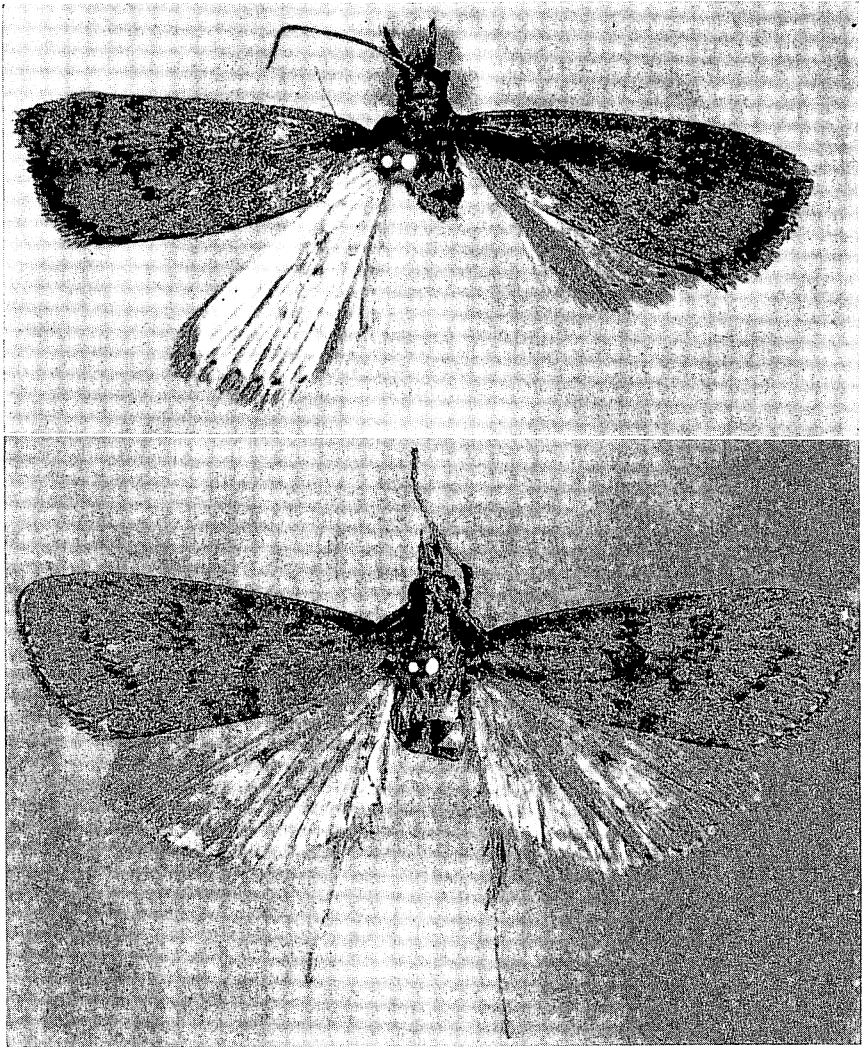


Figure 113—*Oeobia liopis rhodias* (Meyrick). Above: The female type; Lanai, 3,000 feet; expanse, 20 mm.; genitalia illustrated. Below: A female from Molokai, 4,500 feet.



Figure 114—*Oeobia litorea* (Butler). Above: The male type; "Hawaiian Isl. 82-98" (Blackburn); length of a fore wing, 6.5 mm.; genitalia figured. Below: The female type of the synonym *Pionea poliochroa* Hampson; Waialua Coast, Oahu; expanse, 19 mm.; the narrow dark shade on the right fore wing is the shadow of the pin; genitalia figured.

***Oeobia dracontias* (Meyrick), new combination (fig. 105).**

Pyrausta dracontias Meyrick, 1899:221, pl. 6, fig. 2.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Unfortunately, the abdomen of the holotype in the British Museum has been lost, and I cannot figure the genitalia.

Meyrick placed the species in *Oeobia* in his collection.

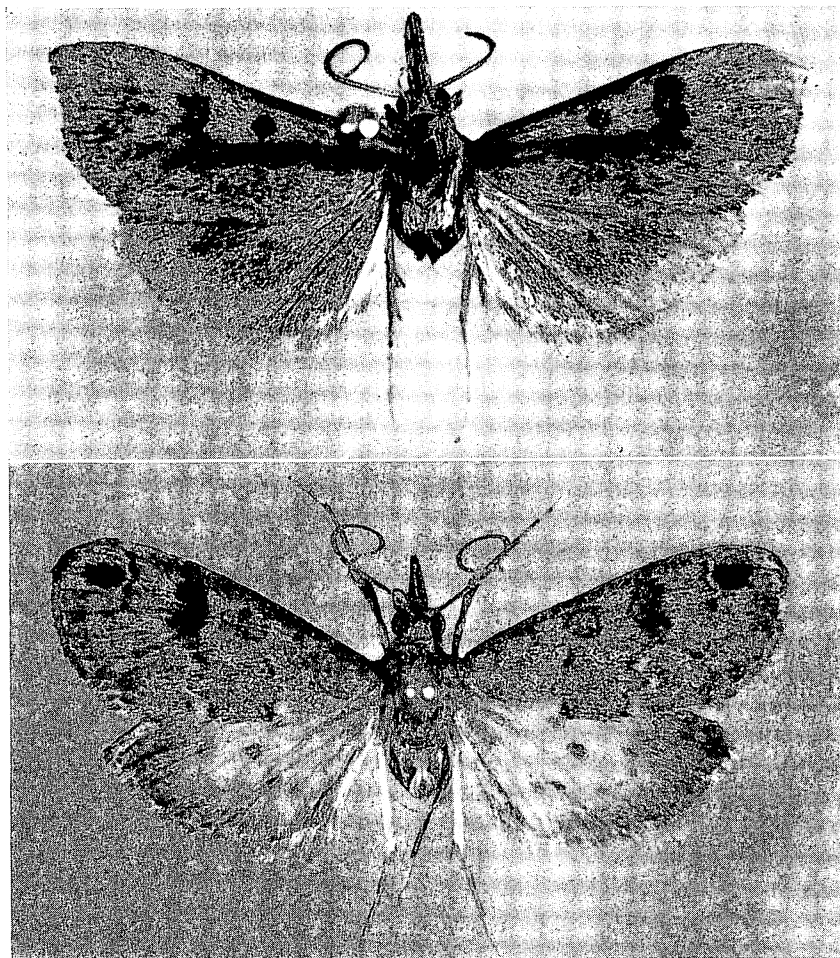


Figure 115—*Oeobia*. Above: The male type of *melanopis* (Meyrick); Olaa, Hawaii, 2,000 feet; expanse, 20 mm.; the longitudinal dark streaks on the fore wings are, unfortunately, shadows cast by the pin; genitalia illustrated. Below: The male type of *melasema* (Meyrick); Hilo, Hawaii, 2,000 feet; expanse, 20 mm.; genitalia illustrated.

***Oeobia dryadopa* (Meyrick), new combination** (figs. 105, 131).

Pyrausta dryadopa Meyrick, 1899:222.

Endemic. Kauai, Oahu, Maui (type locality: Haleakala, 5,000 feet).

Hostplant: *Scaevola glabra*.

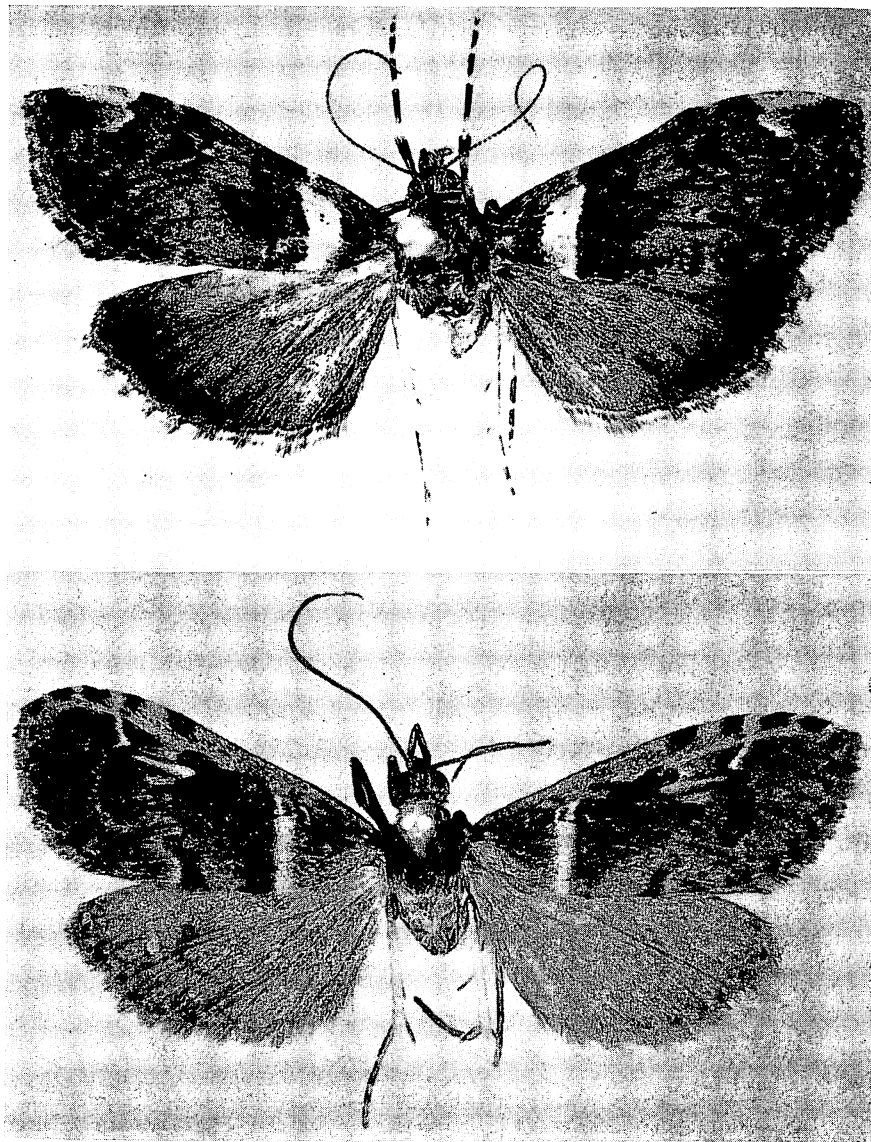


Figure 116—*Oeobia micacea* (Butler). Above: A female from the Waimea Mts., Kauai, 4,000 feet; expanse, 21.5 mm. Below: The male type of the synonym *Phlyctaenia iocrossa* Meyrick; Molokai Mts., above 4,000 feet; expanse, 24.5 mm. Genitalia of these specimens illustrated.

Parasites: *Angitia blackburni* (Cameron), *Casinaria infesta* (Cresson).

The larvae, which Swezey once thought were *litorea*, were described for me by him as follows: The caterpillars feed between contiguous leaves in the crown of *Scaevola glabra* plants. They are 20 mm. long; the middle part of the body is somewhat thickened; head testaceous with a heavy brown stripe on each side, but not including the black eyes; a short, black, longitudinal bar near each lateral margin of the prothoracic shield; spiracles and setae dark; no distinctive markings on the other body segments.

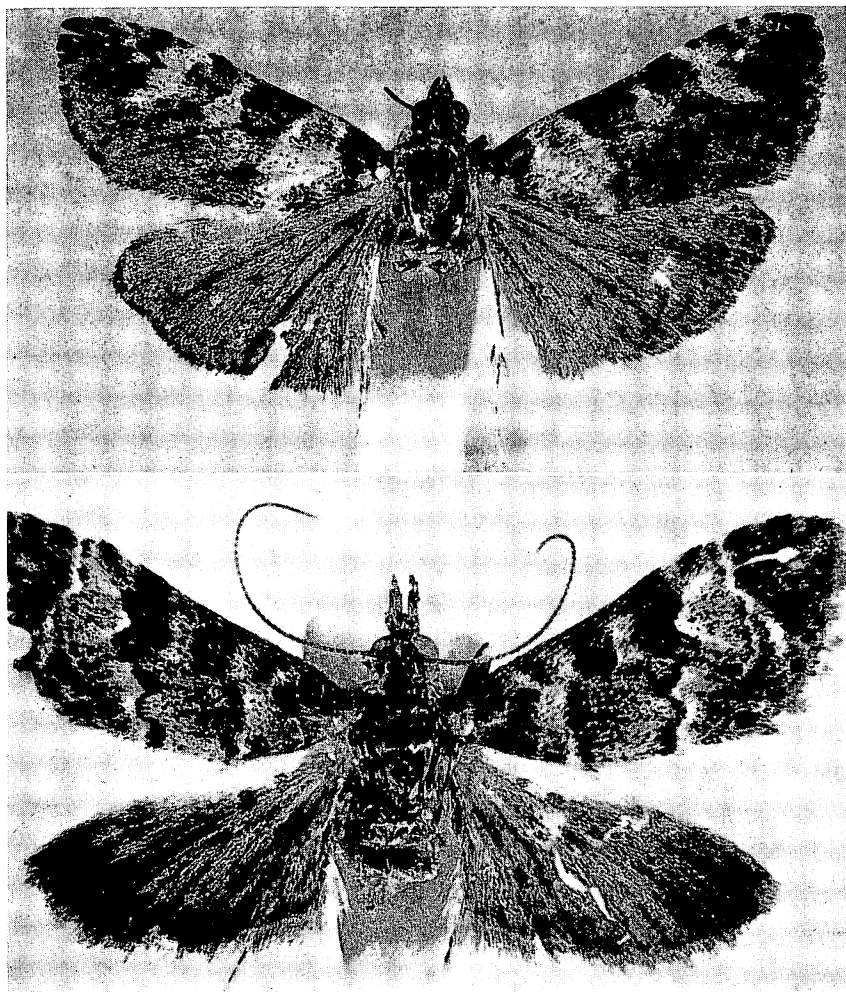


Figure 117—*Oeobia*. Above: The female type of *monticolans* (Butler); "Hawaiian Isls. 82-9 (158)" (Blackburn); expanse, 20 mm. Below: The female type of *nigrescens* (Butler); "Hawaiian Islands 81-7 136" (Blackburn); expanse, 15 mm., but wings bent strongly downward. Genitalia of these types figured.

Oeobia endopyra (Meyrick), **new combination** (figs. 106, 132).

Phlyctaenia endopyra Meyrick, 1899:219; 1904:360. Swezey, 1954:182.

Endemic. Oahu, Molokai, Maui, Hawaii (type locality: Hilo, 2,000 feet).

Hostplant: *Rubus hawaiiensis*; rolls the leaves.

Parasite: *Horogenes blackburni* (Cameron).

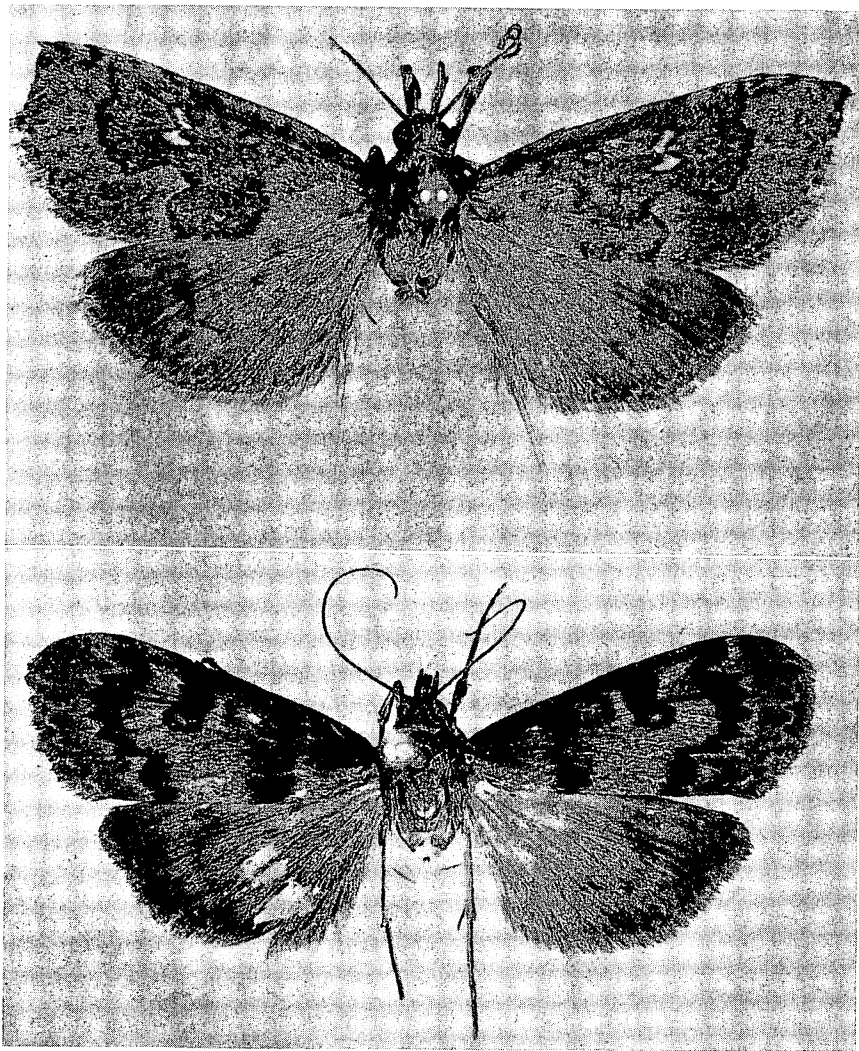


Figure 118—*Oeobia*. Above: *ommatis* (Meyrick), male type; Molokai Mts., above 3,000 feet; expanse, 26 mm. Below: The female type of *pachygramma* (Meyrick); Waianae Mts., Oahu, 2,000 feet; expanse, 28 mm. Genitalia of these examples illustrated.

Oeobia ennychioides (Butler), new combination (figs. 90, 107, 131, 158).

Mecyna ennychioides Butler, 1881:328.

Melanomecyna ennychioides (Butler) Butler, 1883:179. Type of *Melanomecyna*.

Scopula ennychioides (Butler) Meyrick, 1888:221.

Pionea ennychioides (Butler) Hampson, 1899:244.

Phlyctaenia ennychioides (Butler) Meyrick, 1899:216; 1904:359.

Endemic. Kauai, Oahu, Maui (type locality: Haleakala, 4,000 feet).

Hostplant: Unknown.

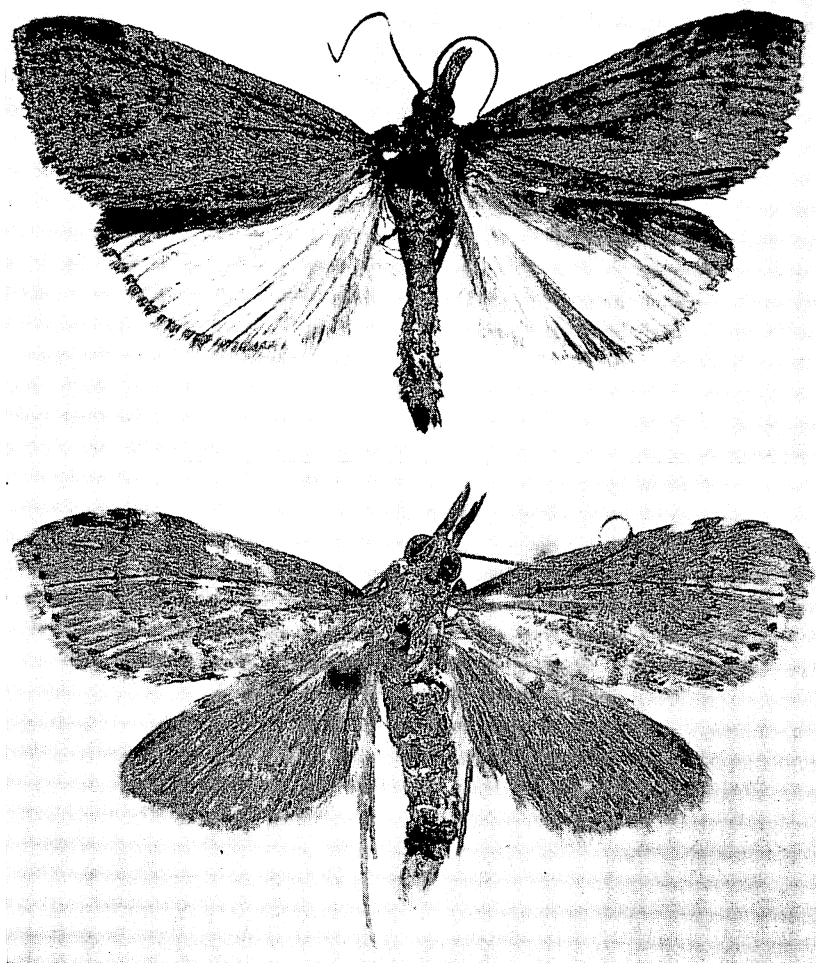


Figure 119—*Oeobia*. Above: The male type of *phaethontia* (Meyrick); Olaa, Hawaii; expanse, 37 mm. Below: The type of *phyllostegia* (Swezey); Pacific Heights, Honolulu; length of a fore wing, 9 mm.

This species and *stellata* are closely similar forms and further study is needed to clarify the situation. Meyrick (1899:216) merged *stellata* with *ennychioides*, but later (1904:359) he said that he was in error and that they were good species. Swezey's record of a plant which might have been *Bobea* as the hostplant for this species (1910:137) is based upon a misidentification and the species involved was *caminopis*.

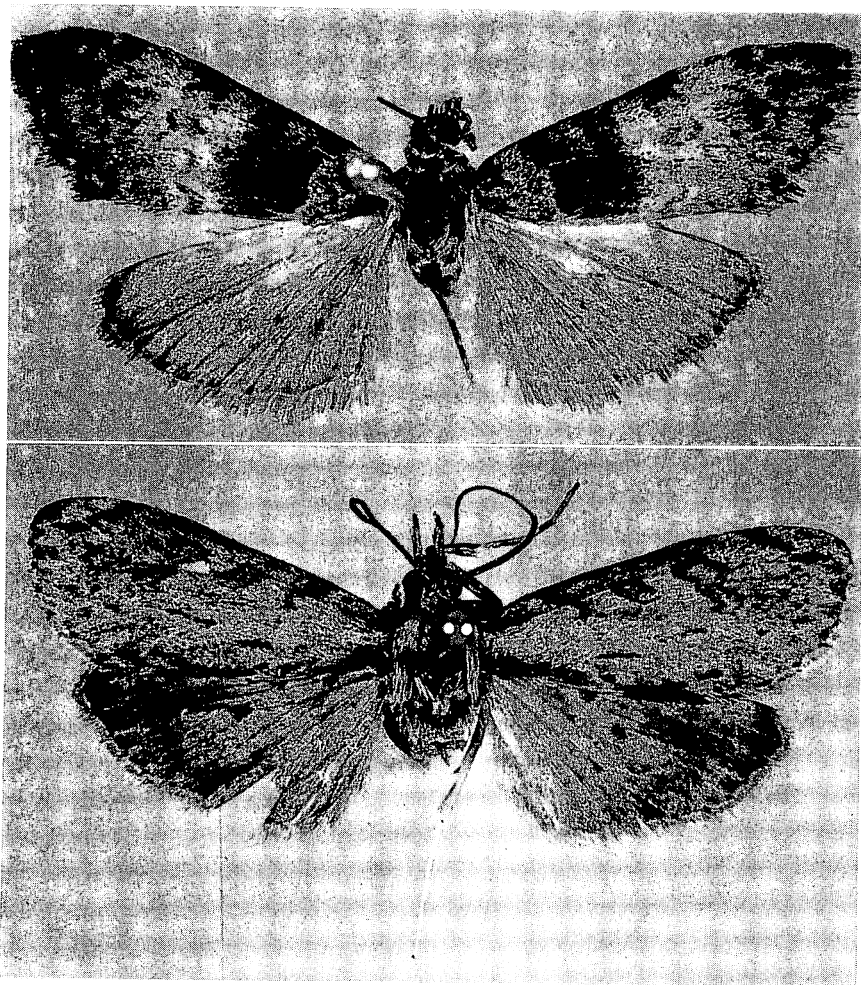


Figure 120—*Oeobia*. Above: *platyleuca* (Meyrick), male type; Haleakala, Maui, 5,000 feet; expanse, 23 mm. Below: *psychrope* (Meyrick), male type; Waimea Mts., Kauai, 4,000 feet; expanse, 22.5 mm. Genitalia of these specimens illustrated.

Oeobia ephippias (Meyrick), **new combination** (figs. 108, 133, 161).

Phlyctaenia ephippias Meyrick, 1899:210, pl. 5, fig. 24.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet), Oahu, Molokai, Maui.

Hostplant: Unknown.

This species has been confused in collections with *platyleuca*.

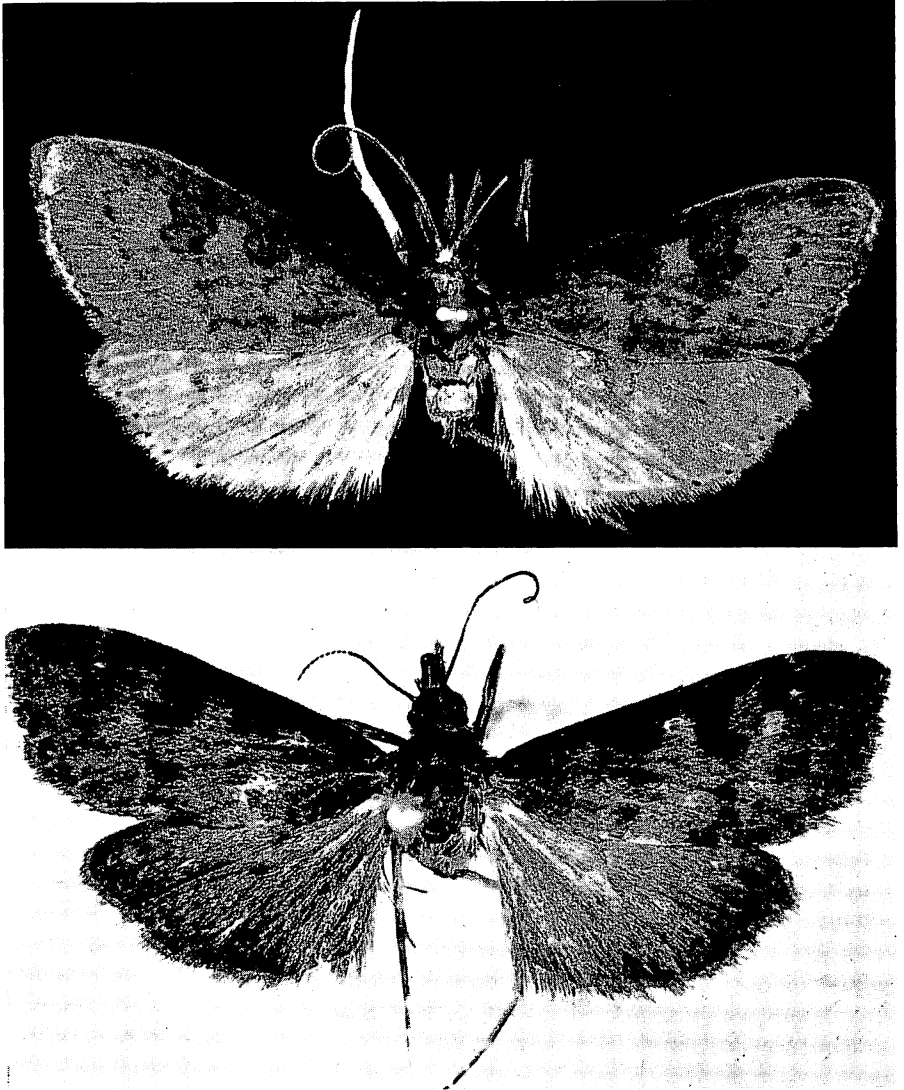


Figure 121—*Oeobia*. Above: The male type of *pyranthes* (Meyrick); Waimea Mts., Kauai, 4,000 feet; expanse, 22 mm.; genitalia illustrated. Below: *stellata* (Butler); northwest Koolau Mts., Oahu; expanse, 22 mm.; an example from Meyrick's collection (the male and female types are in too poor condition to photograph with success).

Oeobia eucrena (Meyrick), **new combination** (figs. 109, 133, 159, 160).

Scopula eucrena Meyrick, 1888:218.

Phlyctaenia eucrena (Meyrick) Meyrick, 1899:213, pl. 5, fig. 26.

Pionea leucozonea Hampson, 1913:22. **New synonym.**

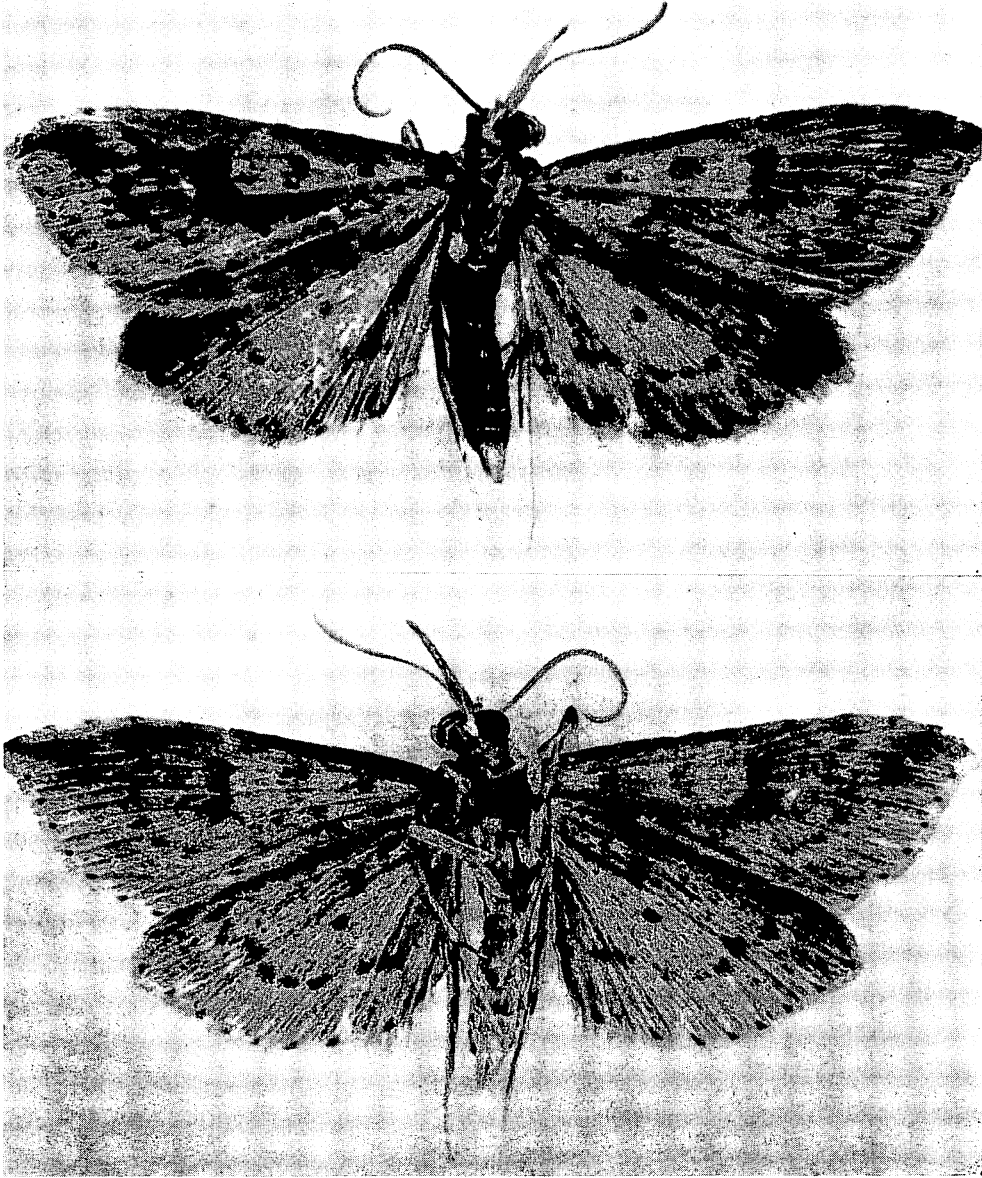


Figure 122—Dorsal and ventral views of a male paratype of *Oeobia swezeyi* (Zimmerman); Kokee, Kauai; this species ranges in expanse from about 28 to 31 mm.

Endemic. Kauai, Oahu, Maui, Hawaii.

Hostplant: *Phyllostegia*, "a labiate."

I am unable to cite the type locality of this species. The original Blackburn example is in Meyrick's collection and it was not labeled as the type. It lacks its abdomen and bears the following label: "Hawaiian Is. TB/81." It has been labeled lectotype.

Meyrick, in his key to species (1888:219), misspelled this species name as "*eucrema*," but in his collection and in *Fauna Hawaiiensis* he used *eucrena*.

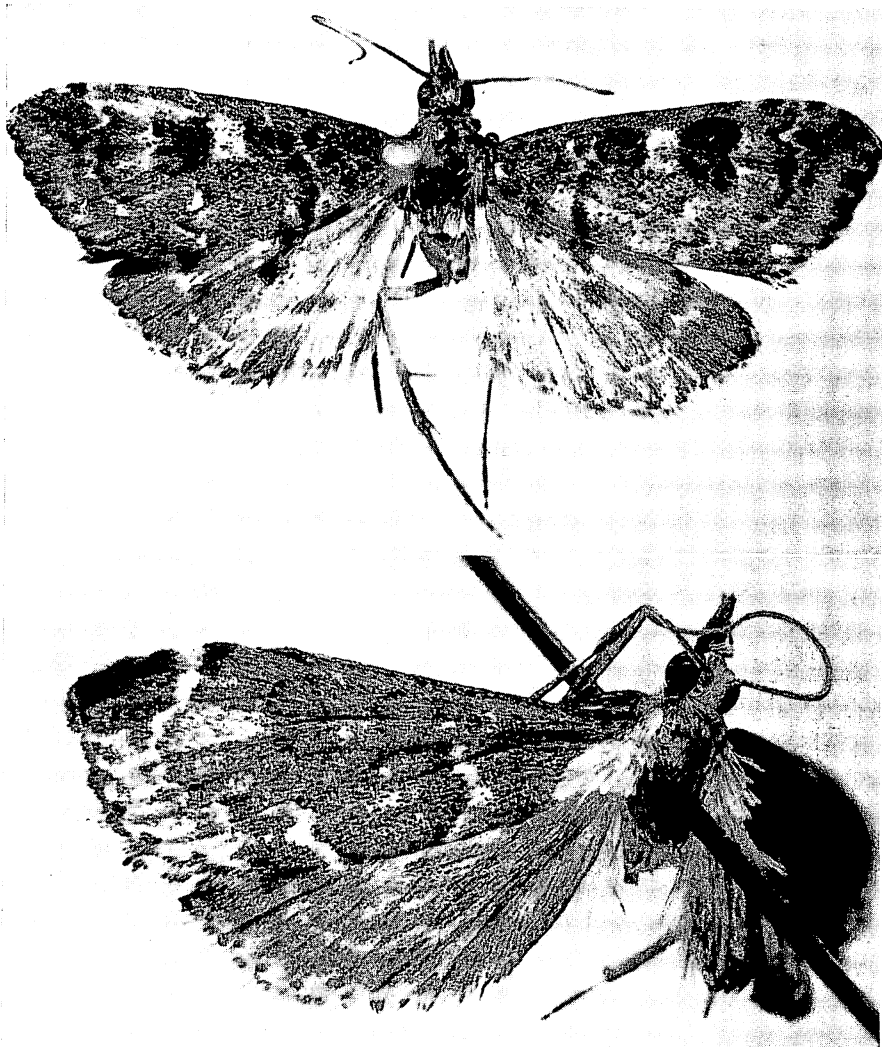


Figure 123—*Oeobia*. Above: The type of *thermantis* (Meyrick) (abdomen lost); Olaa, Hawaii; expanse, 20 mm. Below: The type of *thermantoides* (Swezey) (abdomen also missing); Kilauea, Hawaii; fore wing 8.5 mm. long.

The color pattern varies in intensity and extent. The female has an unusual ovipositor. The lobes are longer than broad; on all of the other species of the genus seen, the lobes are transverse. One might conclude from an examination of the ovipositor alone that this species does not belong to this genus. This is a most unusual tangent development, and it would be interesting to pursue the problem farther. Does this species have distinctive habits?

Pionea leucozonea, which I have reduced to synonymy above, has heretofore been overlooked by Hawaiian entomologists, and its name does not appear in Hawaiian literature. It was described from one example taken by Perkins at Kilauea, Hawaii, and it is a female, not a male as determined by Hampson. When I dissected it and compared the genitalia with the dissection of *eucrena*, I was surprised to find differences in the plate and signum, and at first I was inclined to consider that one of the specimens had abnormal genitalia. However, I dissected a third female only to find it different from the other two. Considerable variation appears to exist. The first specimen of *eucrena* dissected and the type of *leucozonea* have a similar elongate type of signum, but the third example has a more or less elongate arrowhead-like signum which appears to have lost the posterior extension beyond the expanded part. Such variability is most confusing.

***Oeobia helioxantha* (Meyrick), new combination** (figs. 91, 92, 110, 162).

Loxostege helioxantha Meyrick, 1899:226, pl. 6, fig. 8.

Endemic. Kauai (type locality: Kaholuamano, 4,000 feet).

Hostplant: Unknown.

The angulation of the protuberance of the front of the head in this species is

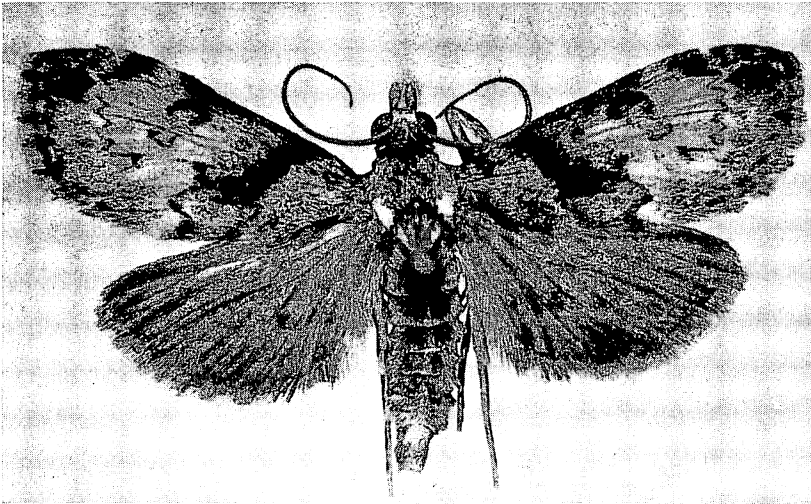


Figure 124—*Oeobia violae* (Swezey), type; Kanehoa, Waianae Mts., Oahu; reared from *Viola*; length of a fore wing, 9.5 mm.

very different from that of *conisalias* and *melanopsis*, the two other species assigned to *Loxostege* in Hawaii. This cephalic protrusion is an independent development.

Meyrick referred this species to *Protocolletis* in the final arrangement of his collection, and Hampson placed the species in *Calamochrous* in his arrangement of the British Museum collection.

Meyrick described *Calamochrous thermochra* from Tahiti (although it probably is not a *Calamochrous*), and it is much like our *helioxantha*. The fore wing pattern is quite like *helioxantha*. However, the palpi are very much shorter and of quite a distinct type, and the proboscis is very long.

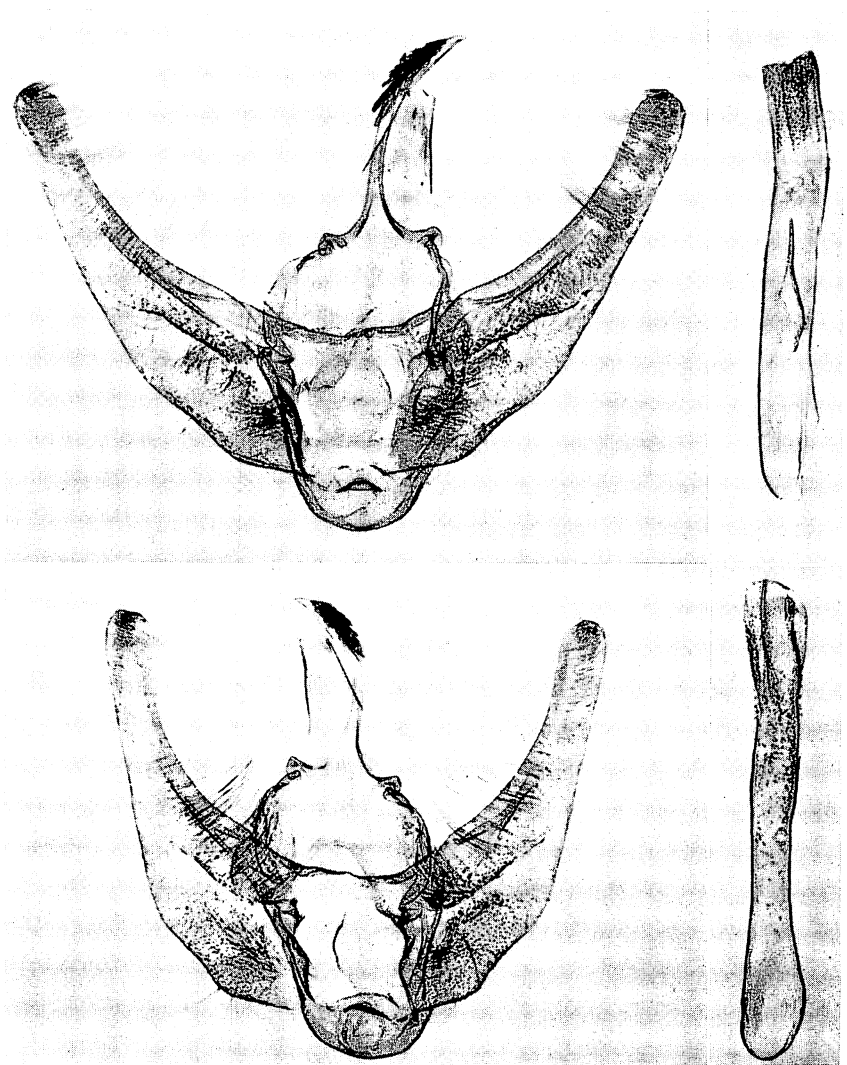


Figure 125—Male genitalia of *Oeobia aurora* (Butler). Above: An example from Lihue, Kauai. Below: The type, with the internal sac of the aedeagus partially extruded and cornutus thus in a different position from that in the top illustration.

Oeobia heterodoxa (Meyrick), **new combination** (figs. 110, 135, 163).

Phlyctaenia heterodoxa Meyrick, 1899:220, pl. 5, fig. 32.

Endemic. Maui (type locality: Haleakala, 5,000 feet).

Hostplant: Unknown.

This is a very distinct little species because of its unusual color pattern and the nearly straight postmedial line in the fore wing. It is known only from the four original specimens collected by Perkins in 1896.

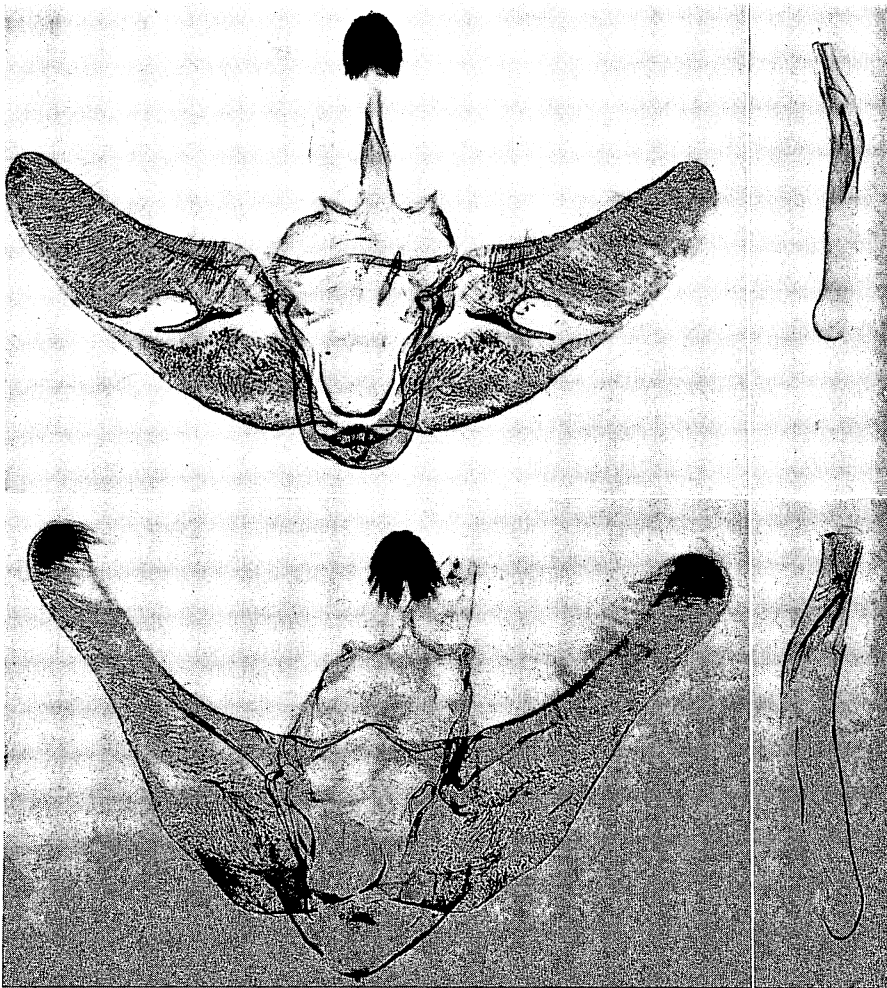


Figure 126—Male genitalia of *Oeobia*. Above: *brontias* (Meyrick), type; Kaholuamano, Kauai, 4,000 feet. Below: *bryochloris* (Meyrick), type; Haleakala, Maui, 5,000 feet.

Oeobia lampadias (Meyrick), **new combination** (figs. 111, 164).

Phlyctaenia lampadias Meyrick, 1904:359.

Endemic. Maui, Hawaii (type locality: Kilauea).

Hostplant: Unknown.

This species was confused with *ennychioides* by Meyrick before 1904. Meyrick noted in his original description that he had both sexes before him, but the three examples in his collection at the British Museum are all females. Perhaps the other two examples mentioned were males or included a male and were sent to

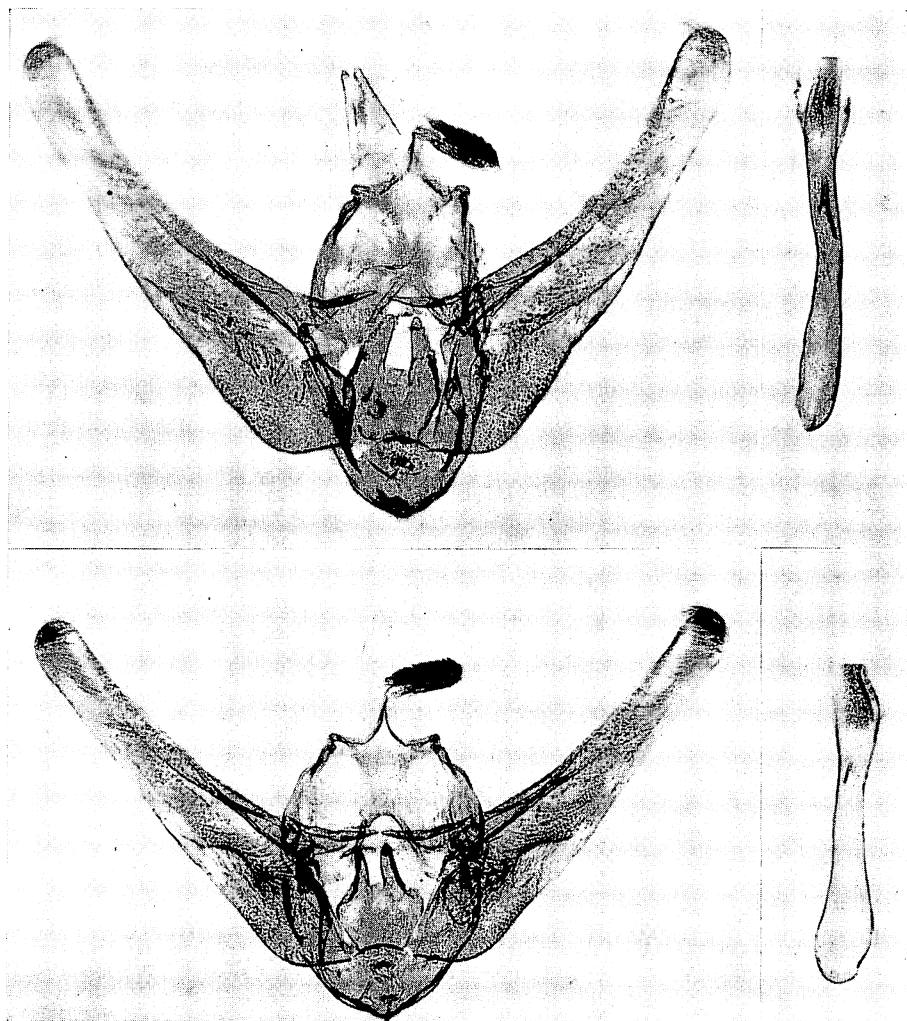


Figure 127—Male genitalia of *Oeobia*. Above: *calliastra calliastra* (Meyrick), type. Below: *calliastra hyacinthias* (Meyrick), type.

Bishop Museum in Honolulu. Meyrick did not designate a type, and I have selected a female collected at Kilauea, Hawaii, by Perkins in August, 1895, to be the lectotype.

***Oeobia liopis liopis* (Meyrick), new combination** (figs. 112, 165).

Phlyctaenia liopis Meyrick, 1899:218, pl. 5, fig. 30.

Endemic. Maui (type locality: Haleakala, 6,000 feet), Hawaii.

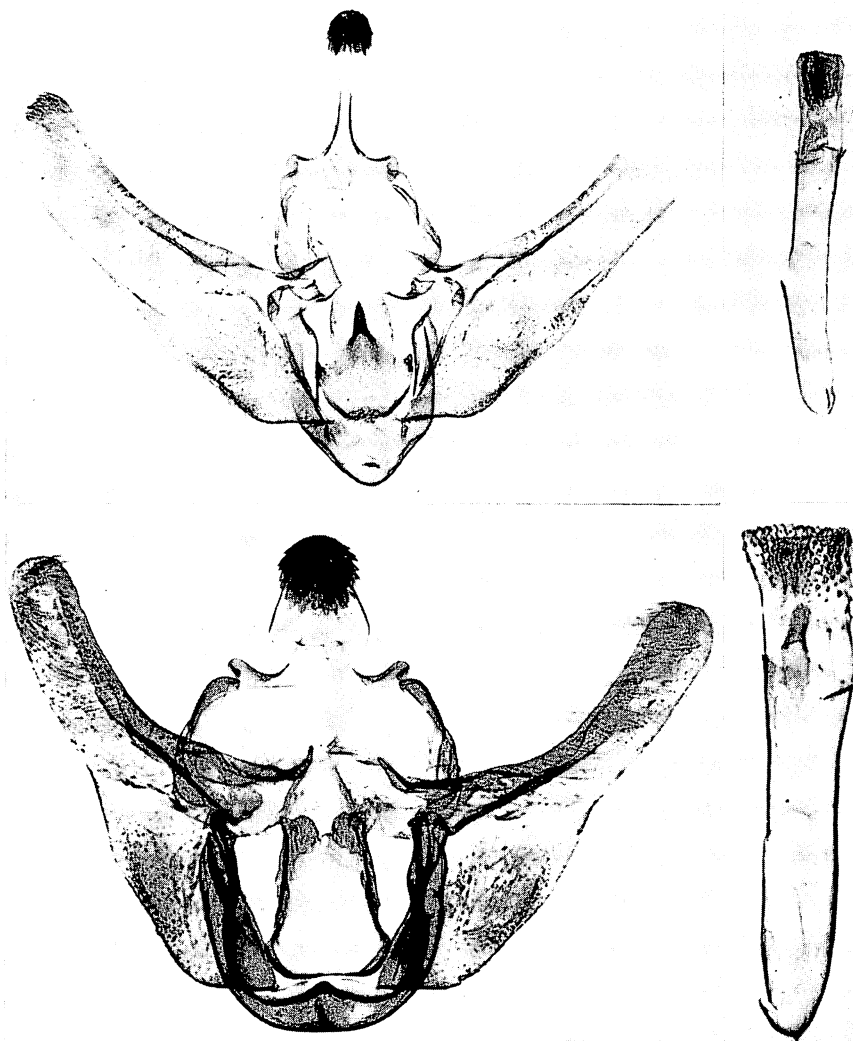


Figure 128—Male genitalia of *Oeobia*. Above: *caminopis* (Meyrick); Molokai, 4,500 feet. Below: *cataphaea* (Meyrick), type; Haleakala, Maui, 6,000 feet; note the rudimentary harpes (claspers) on the valves, best seen on the right side.

Hostplant: Unknown.

The male type has lost the apical part of its abdomen. See the notes under *rhodias*, below.

***Oeobia liopis rhodias* (Meyrick), new combination, new status** (figs. 113, 166).

Phlyctaenia rhodias Meyrick, 1899:219.

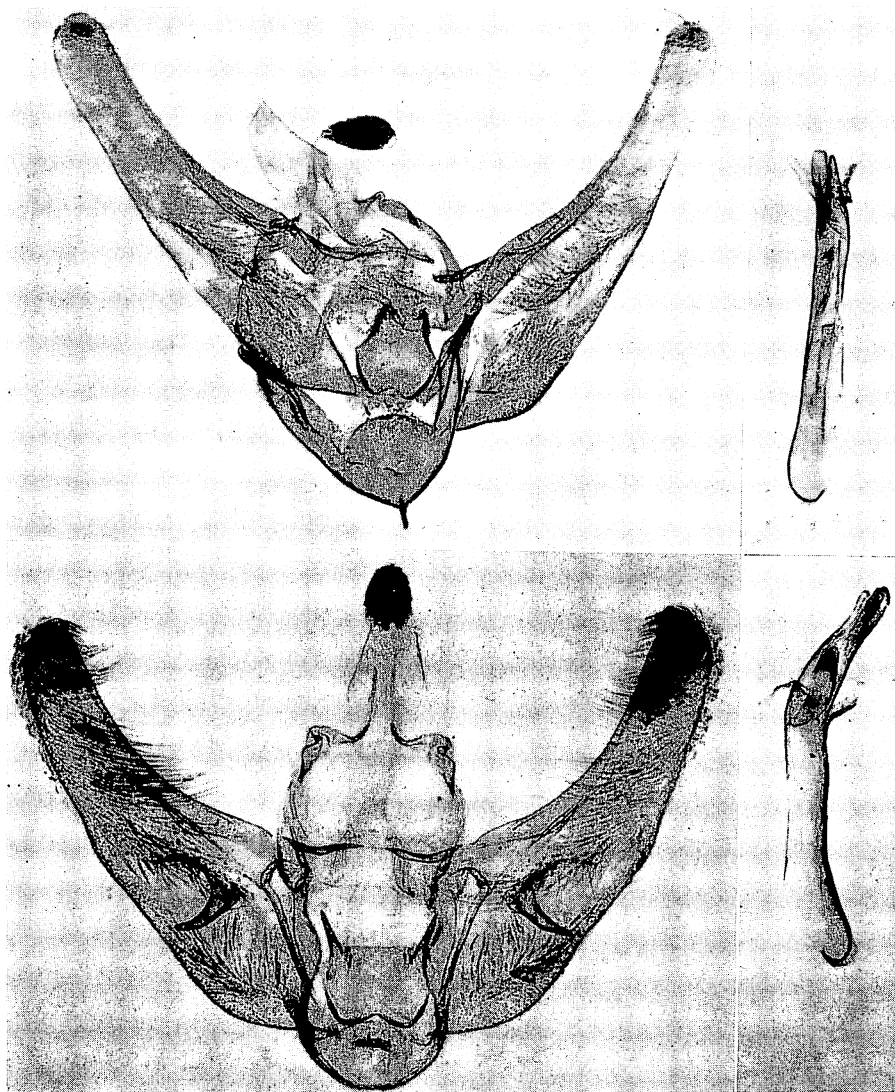


Figure 129—Male genitalia of *Oeobia*. Above: *chalcophanes* (Meyrick), type; Olaa, Hawaii. Below: *chloropis* (Meyrick), type; Kaholuamano, Kauai, 4,000 feet.

Endemic. Kauai, Oahu, Molokai, Lanai (type locality: 3,000 feet).

Hostplant: Unknown.

There is one female in the British Museum collection and one female in the Meyrick collection; dissections of the genitalia reveal identical structure. These

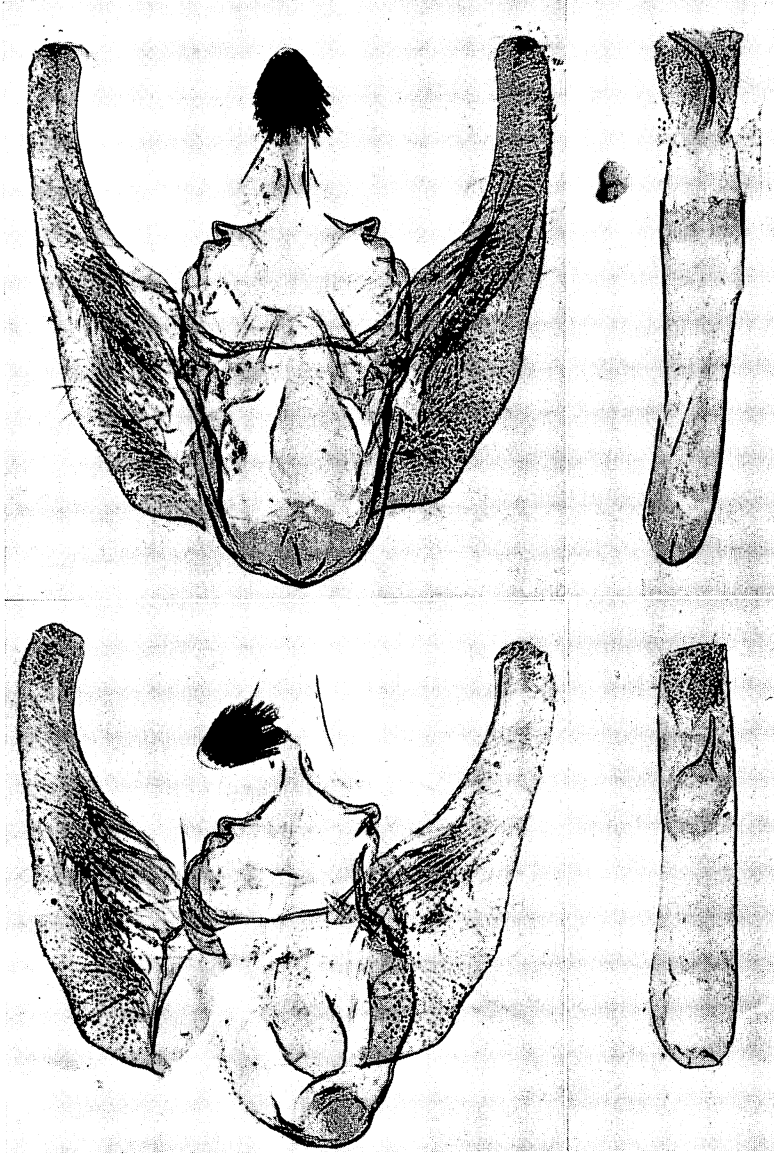


Figure 130—Male genitalia of *Oeobia despecta* (Butler). Above: From an example of the synonym *campylothecae* (Swezey); Haleauau, Oahu; reared from *Bidens*. Below: From the type of the synonym *exigua* (Butler); "Maui 80-31 (27)" (Blackburn); abdomen glued to type. In this example, the cornutus is withdrawn and the broad side is exposed; in the top photograph, the cornutus is partially extruded and its edge is in view.

two examples are outwardly so much like the two specimens of *liopis* in the British Museum that they might be considered the same. The one female of *liopis* with intact abdomen displays distinct differences in the genitalia, and I have therefore considered *rhodias* to be a subspecies of *liopis*. Swezey's *phyllostegia* may belong to this complex, and it may be a synonym.

***Oeobia litorea* (Butler), new combination** (figs. 114, 134, 167).

Scopula litorea Butler, 1883:178.

Eurycreon litorea (Butler) Meyrick, 1888:230.

Pyrausta litorea (Butler) Meyrick, 1899:224; 1904:133.

Pionea poliochroa Hampson, 1913:20. **New synonym.**

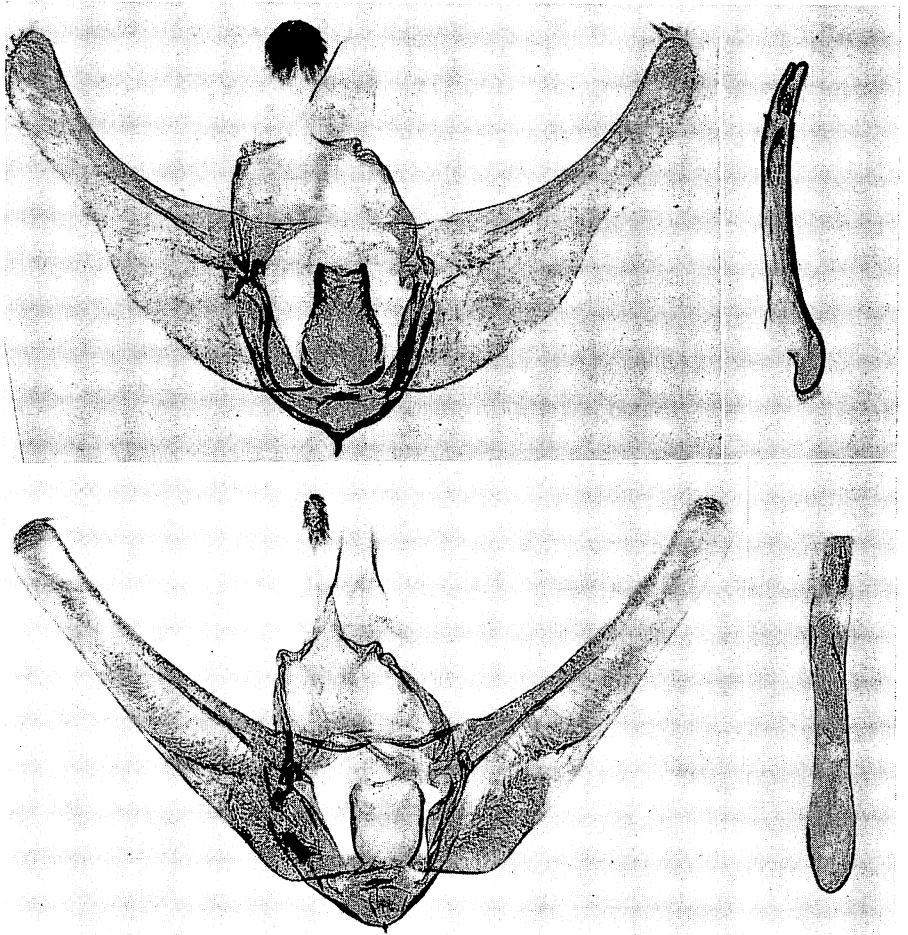


Figure 131—*Oeobia* male genitalia. Above: The type of *dryadopa* (Meyrick); Haleakala, Maui, 5,000 feet. Below: The type of *ennychioides* (Meyrick); "Hawaiian Isls. 81-7 135" (or possibly 185, the number is not clear on the label) (Blackburn).

Endemic. Oahu, Lanai (type locality: seashore at Maunalei ["Mauna Lea"]).
Hostplant: *Scaevola frutescens* (lobelia).

Parasites: *Brachymeria obscurata* (Walker), *Horogenes blackburni* (Cameron).

This is evidently a lowland species. Dr. Swezey was confused regarding the identity of this and *dryadopa*, but I believe that we have now eliminated the confusion.

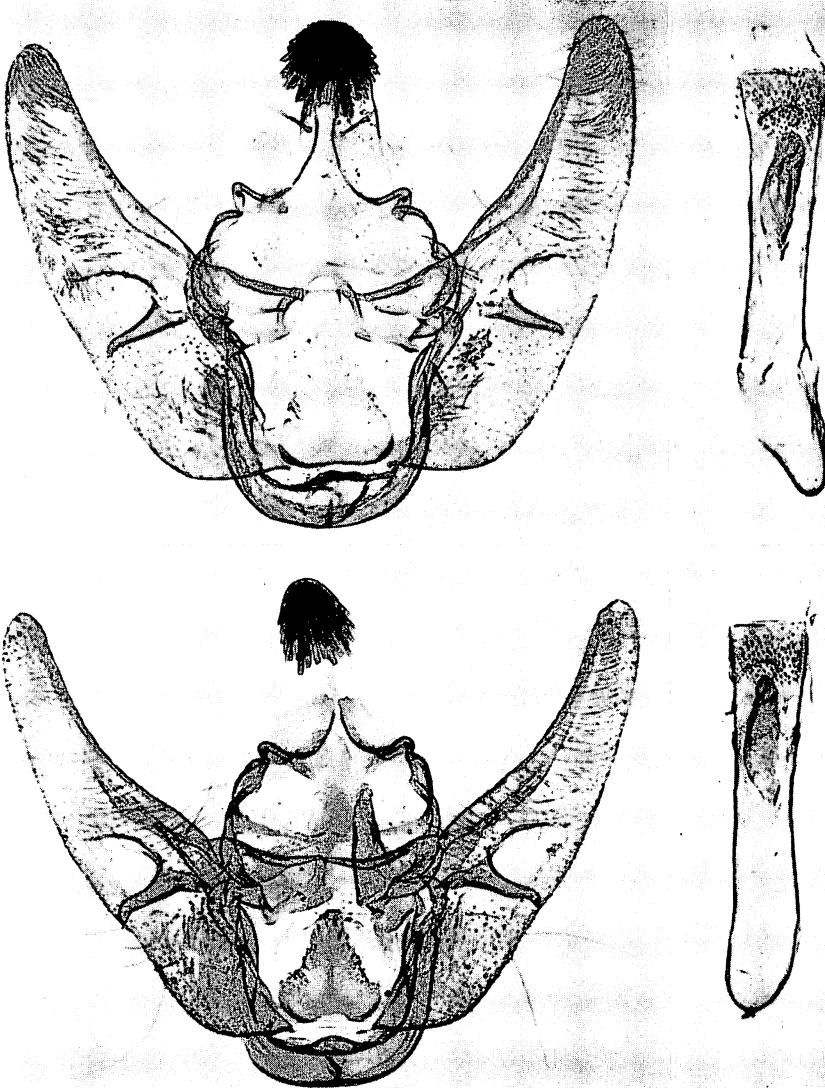


Figure 132—Male genitalia of *Oeobia endopyra* (Meyrick). Above: The type; Hilo, Hawaii, 2,000 feet. Below: An example from Haleakala, Maui, 5,000 feet.

Hampson's *Pionea poliochroa* has been overlooked by Hawaiian entomologists, and the name does not appear in Hawaiian literature. Hampson described one of the specimens (a female) taken by Perkins in 1902 as *poliochroa*, although it had been determined as *litorea* by Meyrick. As noted above, Hampson's name falls into synonymy. Meyrick placed this species in *Protocolletis* in his collection, and Hampson did likewise in the British Museum collection.

Oeobia melanopis (Meyrick), **new combination** (figs. 90, 115, 134).

Loxostege melanopis Meyrick, 1899:226, pl. 6, fig. 7.

Endemic. Hawaii (type locality: Olaa, 2,000 feet).

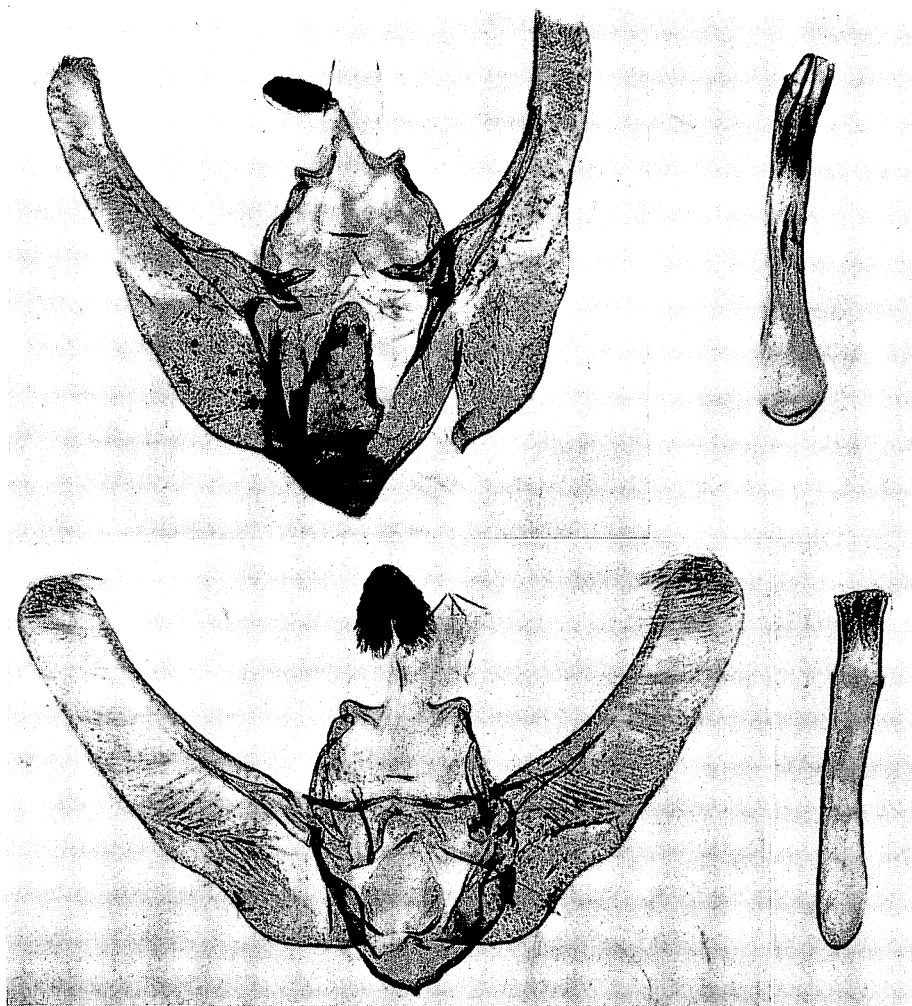


Figure 133—*Oeobia* male genitalia. Above: The type of *ephippias* (Meyrick); Waimea Mts., Kauai, 4,000 feet. Below: *eucrena* (Meyrick); Kaholuamano, Kauai, 4,000 feet.

Hostplant: Unknown.

Hampson placed this species in *Calamochrous* in his arrangement of the British Museum collection.

This is very close to *conisalias*, and I have been inclined to treat it as a color form. The male genitalia are closely similar to those of *conisalias*. However, there does appear to be differences in the male antennae, and, of course, the color pattern on the unique type is quite distinct from that of the two examples of *conisalias* in the British Museum (but the underlying pattern is similar, and it really would not take much change in color intensity to make *melanopsis* quite

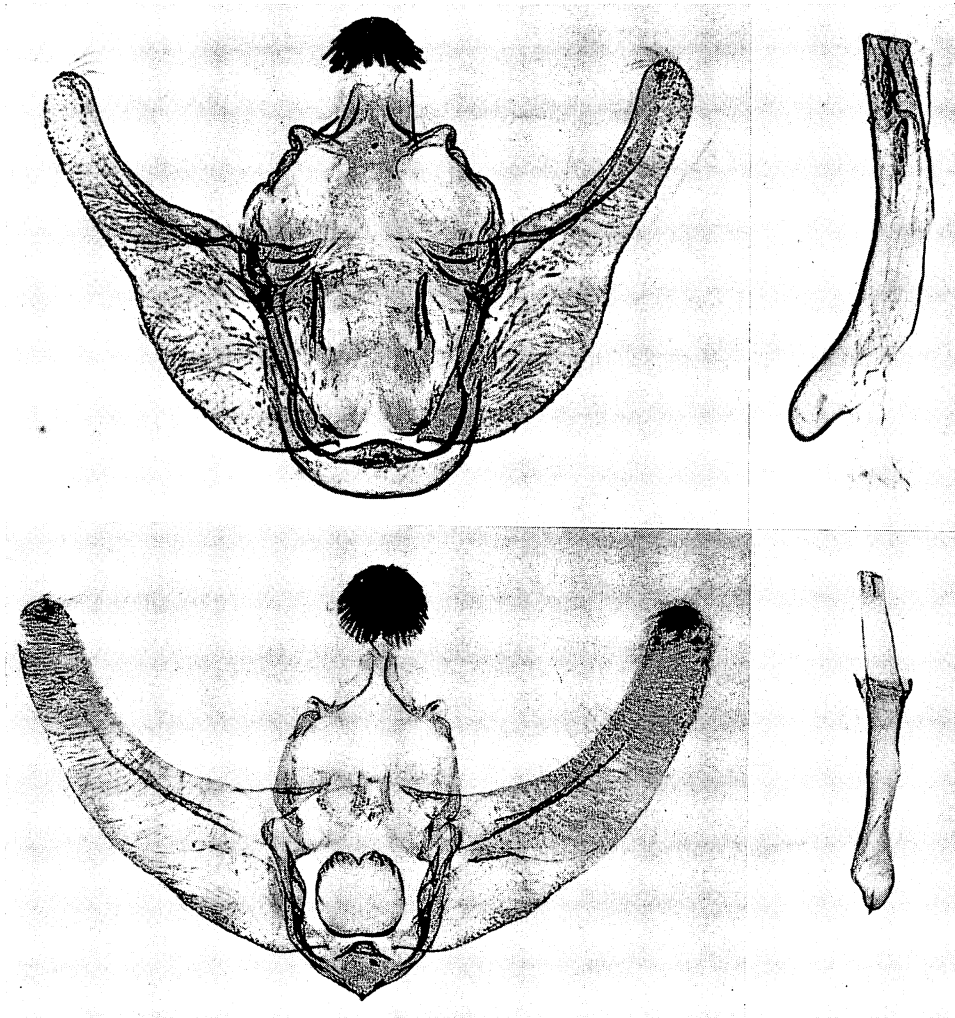


Figure 134—Male genitalia of *Oecobia*. Above: The type of *litorea* (Butler); "Hawaiian Isl. 82-98" (Blackburn); the juxta did not absorb much stain, and its pointed apex is not shown in this photograph. Below: The type of *melanopsis* (Meyrick); Olaa, Hawaii, 2,000 feet.

like *conisalias* in this respect). Unfortunately, only one example of *melanopsis* is known; also only one male of *conisalias* is available, and it has damaged and abraded antennae. On the unique male type of *melanopsis*, the long hairs on the subbasal segments of the antennae are subequal to the breadth of the segments, but on the damaged male of *conisalias* these hairs are only about one-half as long as the breadth of the segments. More specimens are needed to settle this question, but there is no doubt that these two forms are closely similar.

***Oeobia metasema* (Meyrick), new combination** (figs. 90, 115, 135, 168).

Phlyctaenia metasema Meyrick, 1899:214, pl. 5, fig. 27.

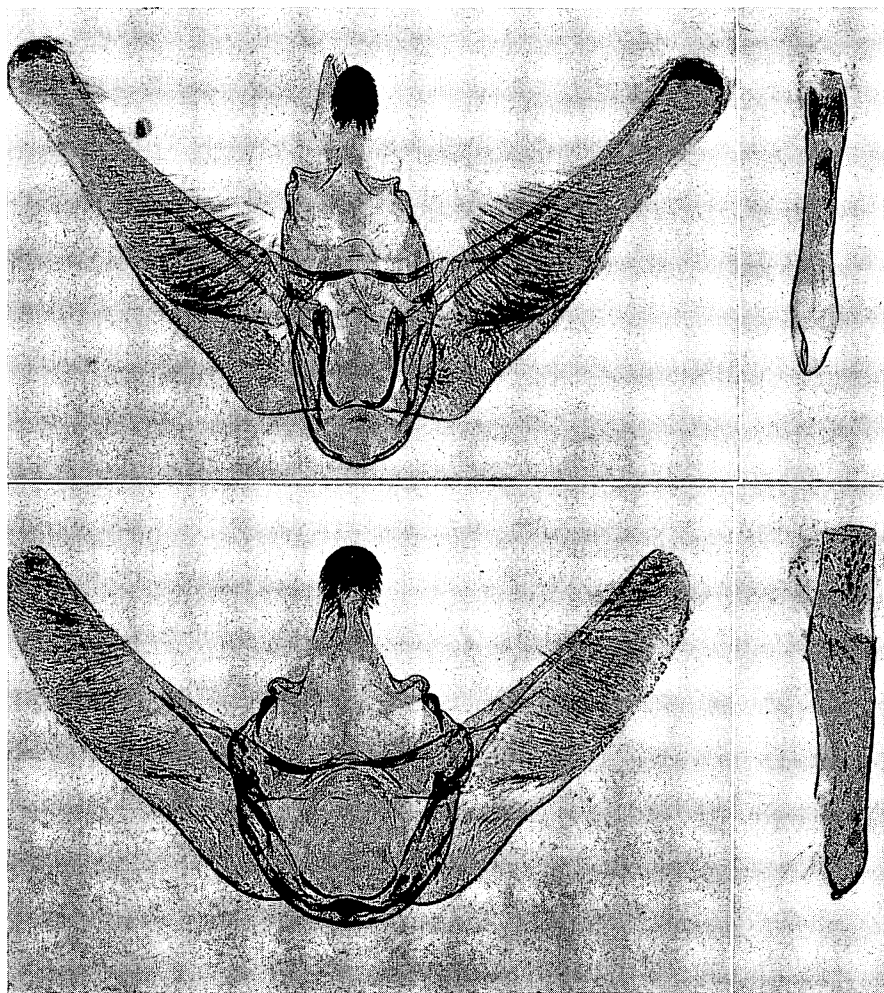


Figure 135—*Oeobia* male genitalia. Above: The type of *Oeobia metasema* (Meyrick); Hilo, Hawaii, 2,000 feet. Below: *heterodoxa* (Meyrick), type; Haleakala, Maui, 5,000 feet.

Endemic. Maui, Hawaii (type locality: Hilo, 2,000 feet).

Hostplant: *Phyllostegia glabra*, "a labiate."

Although the middle tibiae on the males are dilated, Meyrick left this species in *Phlyctaenia* and never mentioned the tibiae.

Dr. Swezey told me that the caterpillar has the head pale testaceous, the eyes

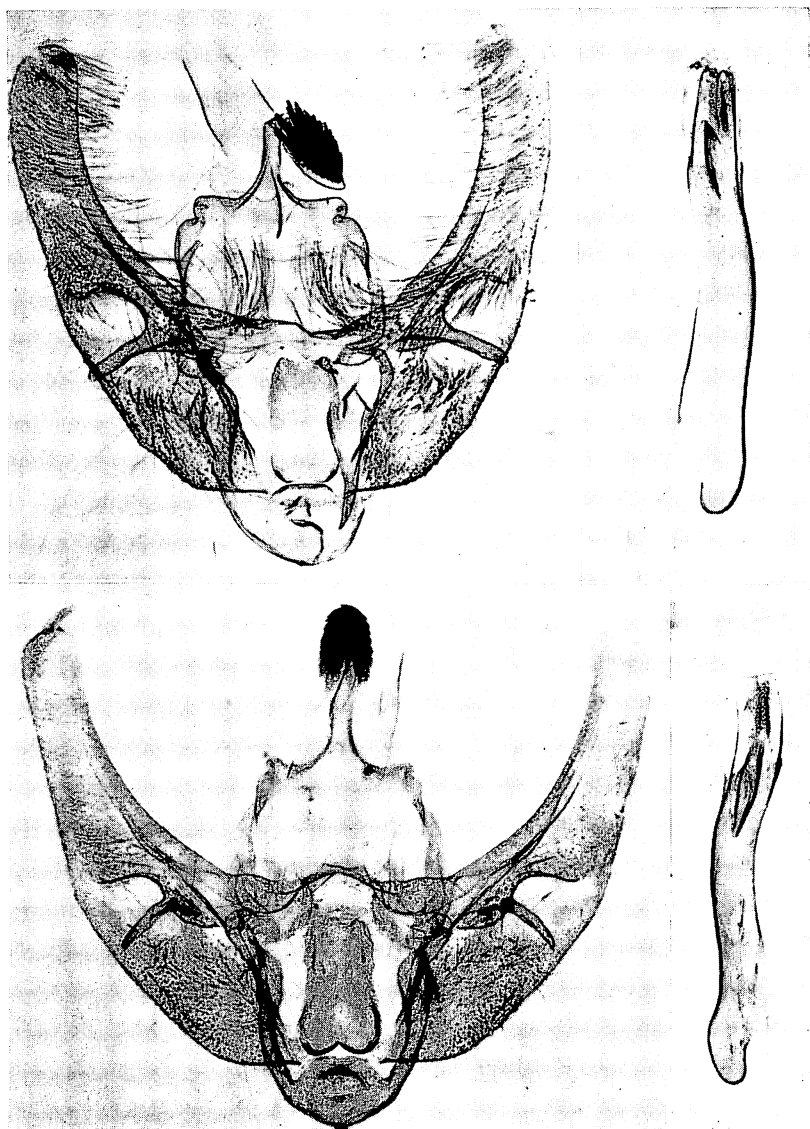


Figure 136—Male genitalia of *Oeobia micacea* (Butler). Above: A specimen from the southeastern Koolau Mts., Oahu. Below: The type of the synonym *Phlyctaenia iocrossa* Meyrick; Molokai Mts., above 4,000 feet. The aedeagi are viewed from opposite sides.

black, a roundish dark spot in each lobe in front, and the upper part with a mosaic of pale brown; the prothoracic shield has a black bar near each lateral margin; there are no other distinctive markings on the prothoracic shield or on the other body segments.

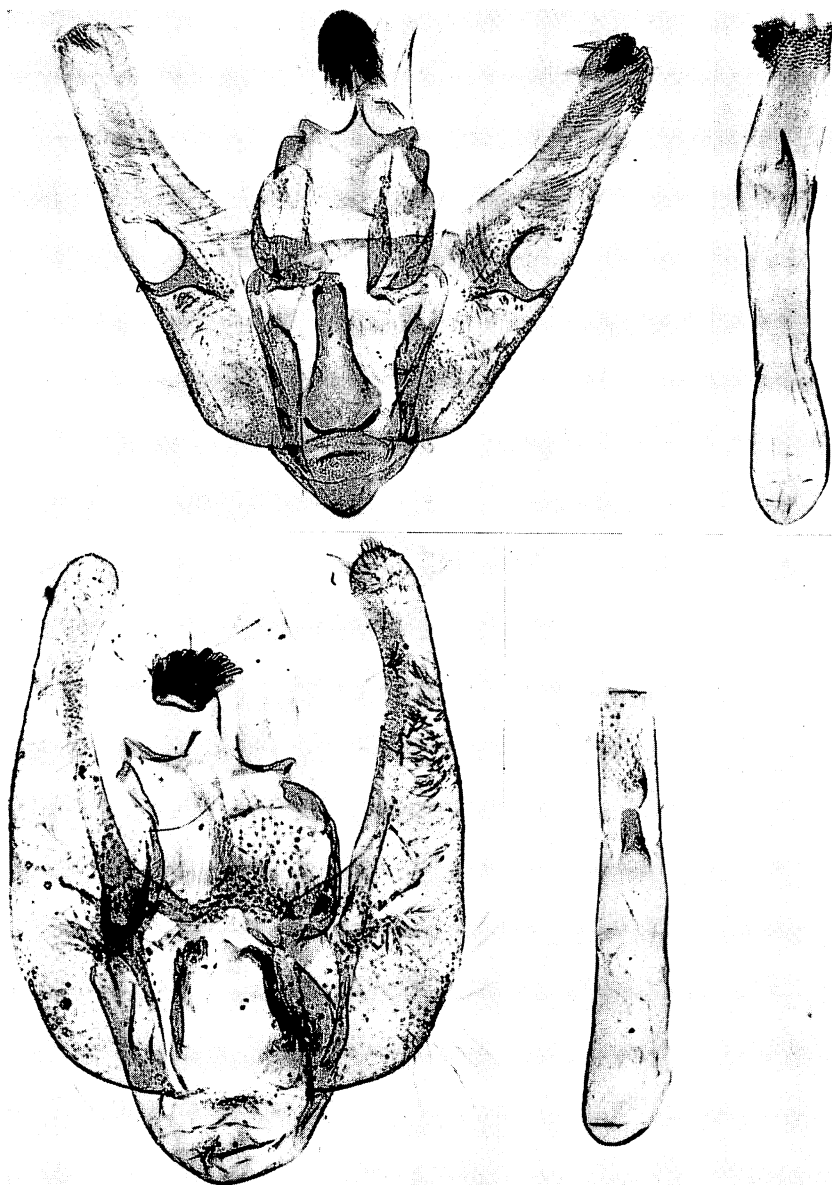


Figure 137—Male genitalia of *Oeobia*. Above: *monticolans* (Butler); Kaholuamano, Kauai. Below: *nigrescens* (Butler); Kona, Hawaii, 1,500 feet.

***Oeobia micacea* (Butler), new combination** (figs. 116, 136, 169).

Aporodes ? *micacea* Butler, 1881:326.

Scoparia micacea (Butler) Meyrick, 1888:220.

Phlyctaenia micacea (Butler) Meyrick, 1899:212.

Phlyctaenia iocrossa Meyrick, 1899:212, pl. 5, fig. 25. **New synonym.**

Endemic. Kauai, Oahu, Molokai, Maui (type locality: Haleakala, 4,000 feet).

Hostplants: *Cyrtandra* species, *Cyrtandra cordifolia*.

Parasites: *Athyreodon debilis* (Perkins), *Casinaria infesta* (Cresson), *Pristomerus hawaiiensis* Perkins, *Zaleptopygus flavo-orbitalis* (Cameron).

Meyrick's *iocrossa* is reduced to synonymy because it is the male color form

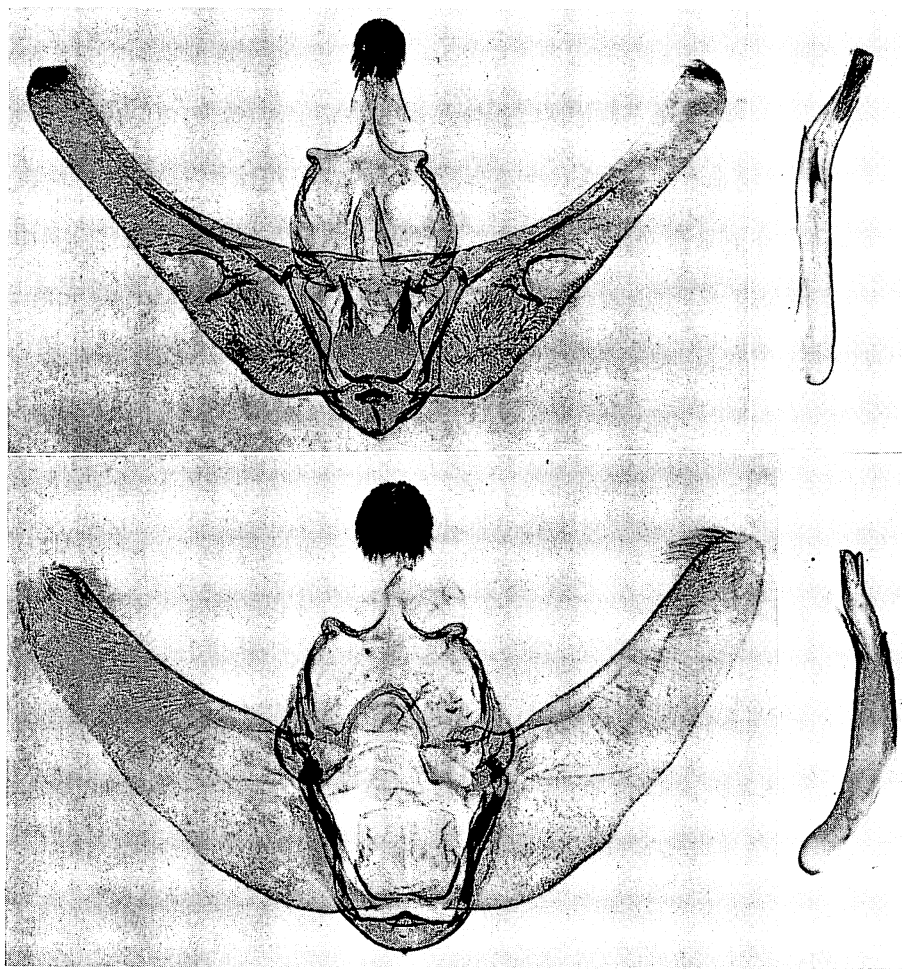


Figure 138—*Oeobia* male genitalia. Above: *ommatias* (Meyrick), type; Molokai Mts., above 3,000 feet. Below: The type of *phaethontia* (Meyrick); Olaa, Hawaii.

which has the costal margin of the fore wing suffused with orange—a variable character. The color pattern in the male differs from that of the female. In the males there is a depressed, longitudinal, pale streak between veins 6 and 7 at the base, which is unusual. Meyrick noted that all of his *iocrossa* were males. In his personal collection he had nine examples under *micacea*; they are all females.

Dr. Swezey gave me the following notes: The head of the caterpillar is pale brown without dark markings except the black eyes. There is a small black mark near each lateral margin of the prothoracic shield. On the other thoracic segments

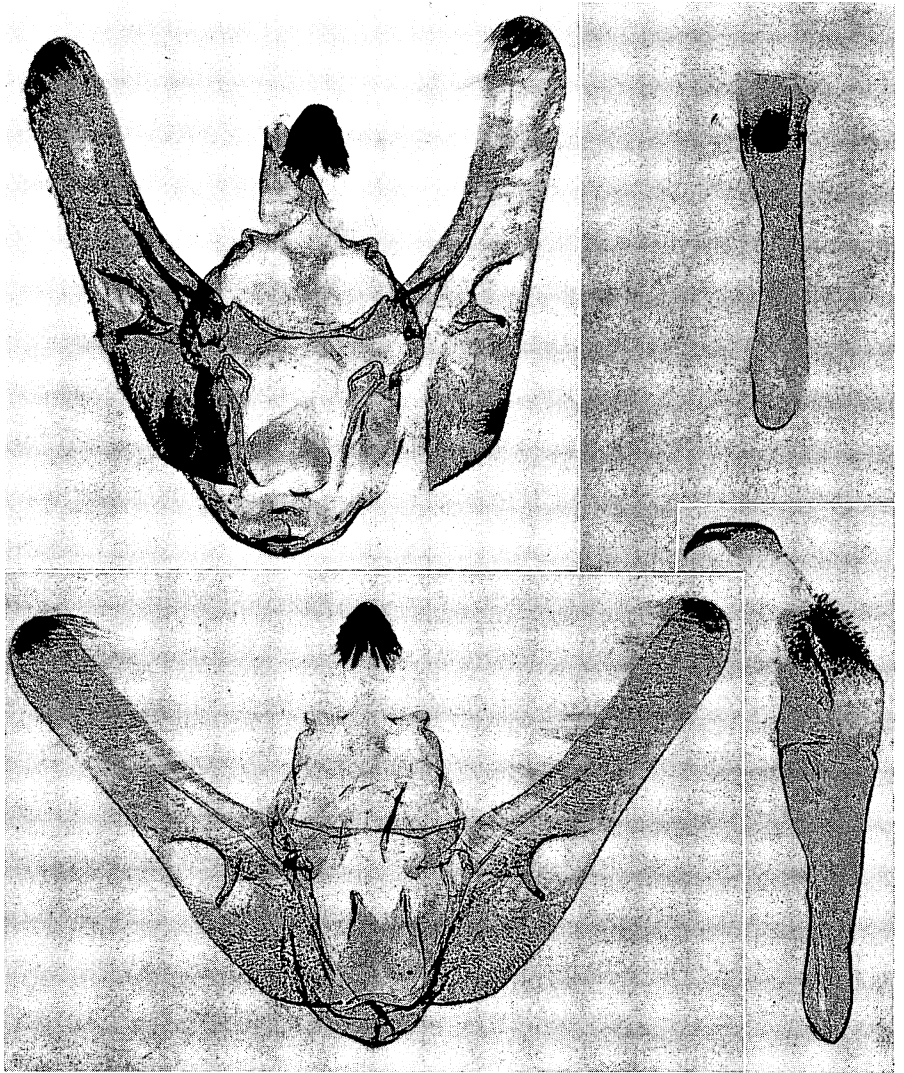


Figure 139—Male genitalia of *Oeobia*. Above: *platyleuca* (Meyrick), type; Haleakala, Maui, 5,000 feet. Below: *psychropa* (Meyrick), type; Waimea Mts., Kauai, 4,000 feet.

and all of the abdominal segments all of the plates in which setae are located are much embrowned. The antennal sheaths extend to the apex of the abdomen on the pupa. Swezey (1954:64) says that he reared a specimen from a larva in a stem of *Cyrtandra cordifolia*.

***Oeobia monticolans* (Butler), new combination** (figs. 117, 137, 170).

Locastra monticolens Butler, 1882:34.

Scopula monticolans (Butler) Meyrick, 1888:219.

Pionea monticolans (Butler) Hampson, 1899:244.

Phlyctaenia monticolans (Butler) Meyrick, 1899:211.

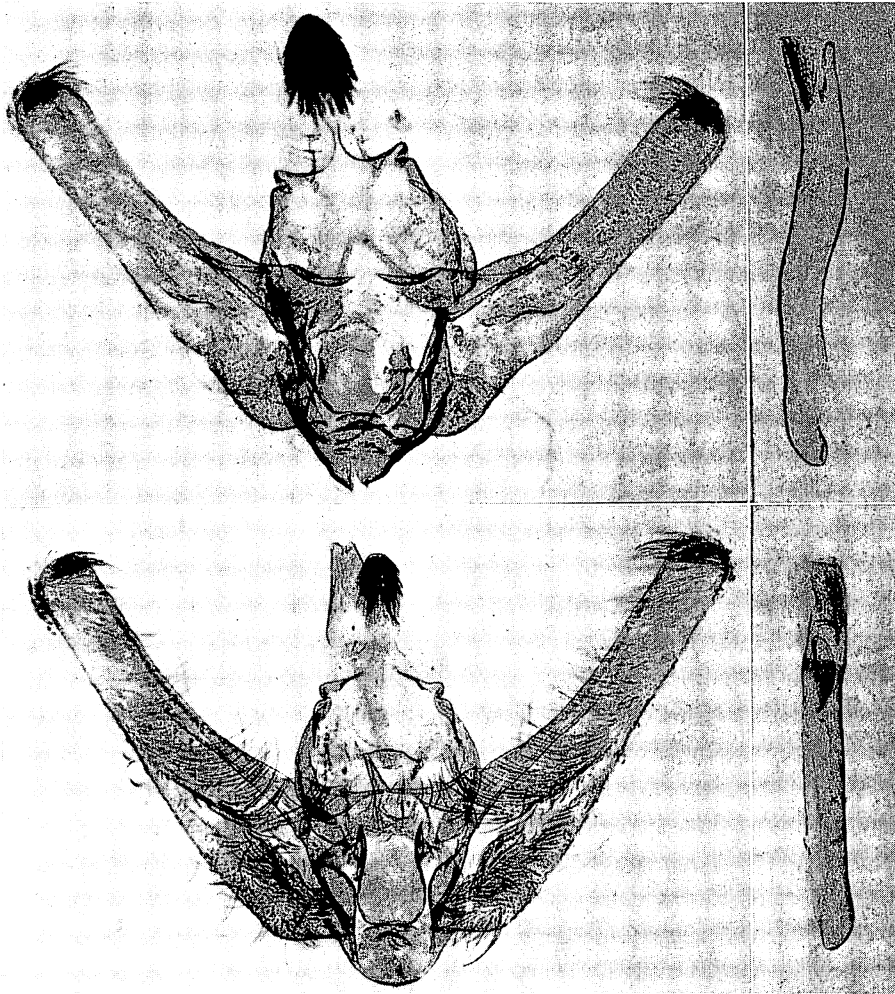


Figure 140—Male genitalia of *Oeobia*. Above: The type of *pyranthes* (Meyrick); Waimea Mts., Kauai, 4,000 feet. Below: From the so-called "female" type of *stellata* (Butler); "Hawaiian Isl. 82-98" (Blackburn).

Endemic. Kauai, Oahu (type locality: near Honolulu, 1,500 feet), Hawaii.

Hostplant: *Ipomoea bona-nox*.

Parasite: *Chaetogaedia monticola* (Bigot).

Dr. Swezey says that the caterpillar has two small black dots on the front of the head and a small black spot near each lateral margin of the prothoracic shield.

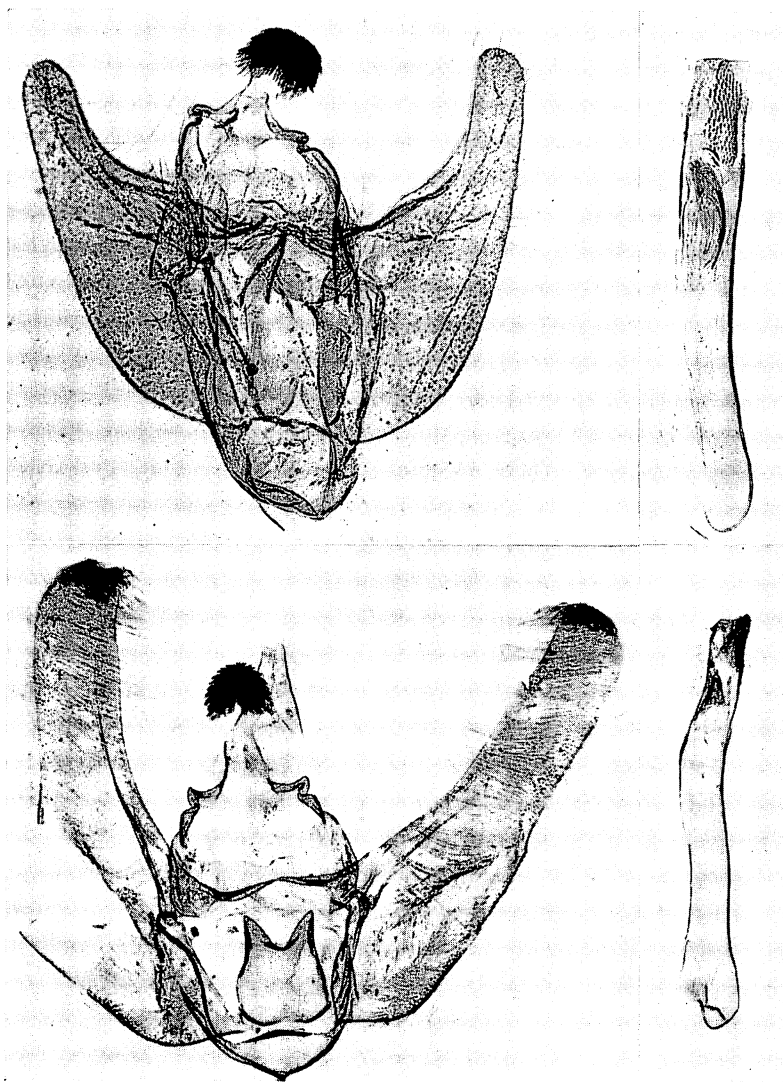


Figure 141—Male genitalia of *Oeobia*. Above: The type of *swezeyi* (Zimmerman); Kokee, Kauai. Below: *thermantis* (Meyrick); Molokai, 4,000 feet.

Oeobia nigrescens (Butler), new combination (figs. 117, 137, 171).*Mecyna nigrescens* Butler, 1881:328.*Melanomecyna nigrescens* (Butler) Butler, 1883:179.*Scoparia nigrescens* (Butler) Meyrick, 1888:220.*Pionea nigrescens* (Butler) Hampson, 1899:244.*Phlyctaenia nigrescens* (Butler) Meyrick, 1899:211. Swezey, 1954:196.

Endemic. Kauai, Oahu, Molokai, Maui (type locality: Haleakala, 4,000 feet), Hawaii.

Hostplants: *Abutilon*, *Sida cordifolia*, *Sida rhombifolia*.

Parasite: *Brachymeria obscurata* (Walker).

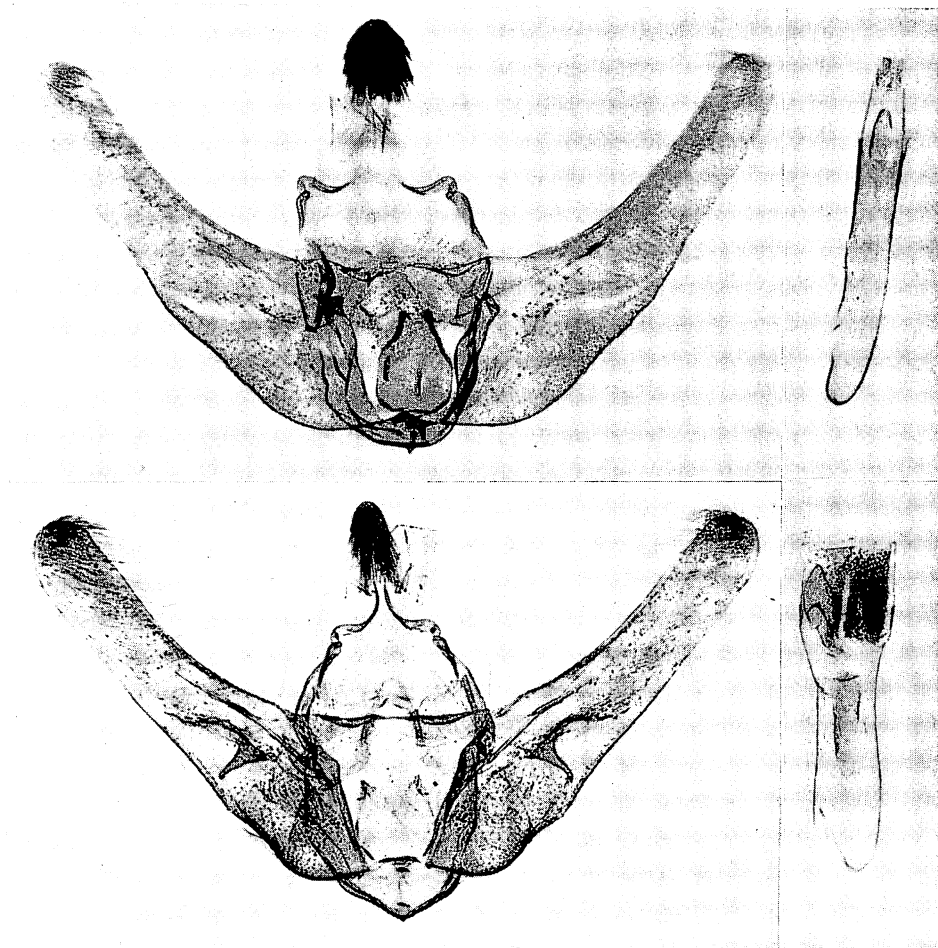


Figure 142—Male genitalia of *Oeobia*. Above: *thermantoides* (Swezey); Kilauea, Hawaii. Below: The type of *violae* (Swezey); Kanehoa, Waianae Mts., Oahu.

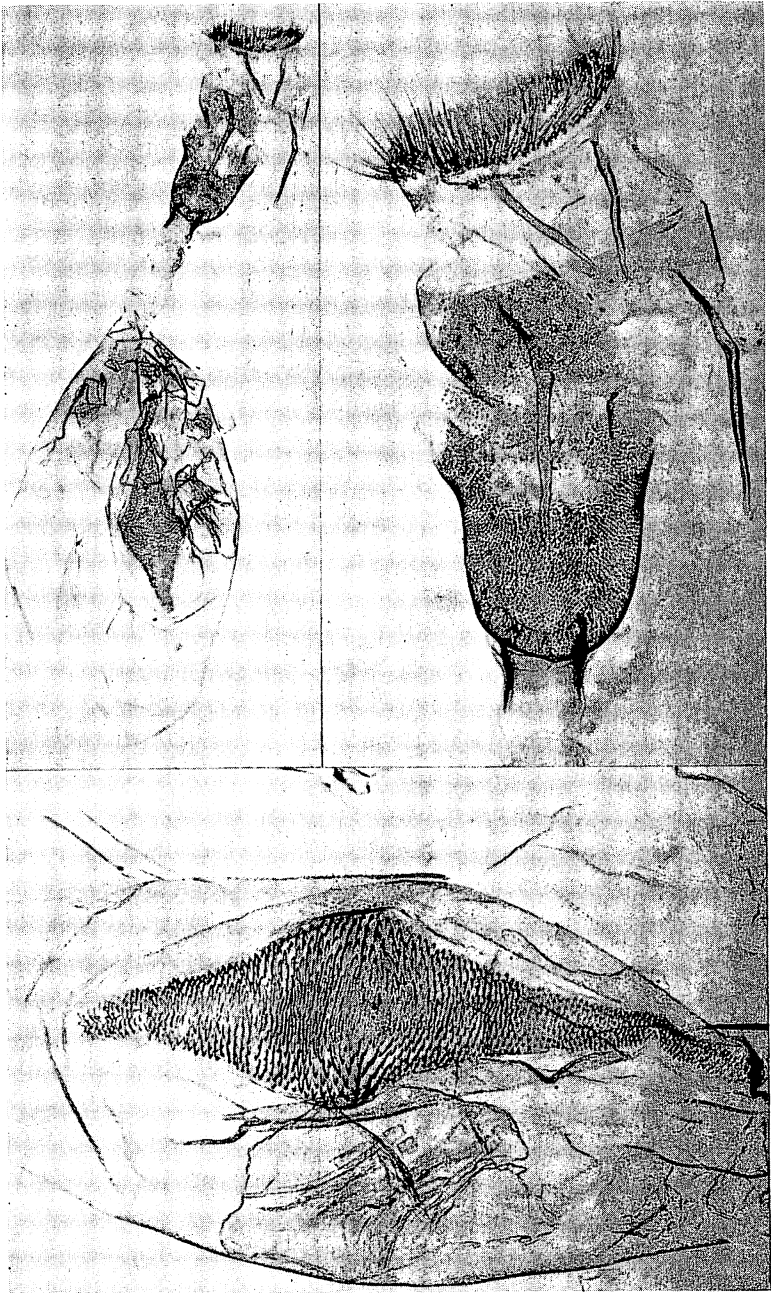


Figure 143—Female genitalia of *Oeobia argoscelis* (Meyrick); Kauai.

***Oeobia ommatias* (Meyrick), new combination** (figs. 118, 138).

Phlyctaenia ommatias Meyrick, 1899:215, pl. 5, fig. 28; 1904:133. Swezey, 1954:72.

Endemic. Kauai, Oahu, Molokai (type locality: 3,000 feet).

Hostplants: *Dubautia laxa*, *Dubautia plantaginea*.

Parasites: *Casinaria infesta* (Cresson), *Eupelmus dysombrias* Perkins.



Figure 144—Female genitalia of *Oeobia brontias* (Meyrick); Kaholuamano, Kauai.

The female genitalia show no indication of a signum—an unusual character. The plain green caterpillars, which have no distinctive markings according to Dr. Swezey, feed between the leaves in the crowns of the plants.

Oeobia pachygramma (Meyrick), **new combination** (figs. 118, 172).

Phlyctaenia pachygramma Meyrick, 1899:216, pl. 5, fig. 29.

Endemic. Oahu (type locality: Waianae Mountains, 2,000 feet), Hawaii.

Hostplant: Unknown.

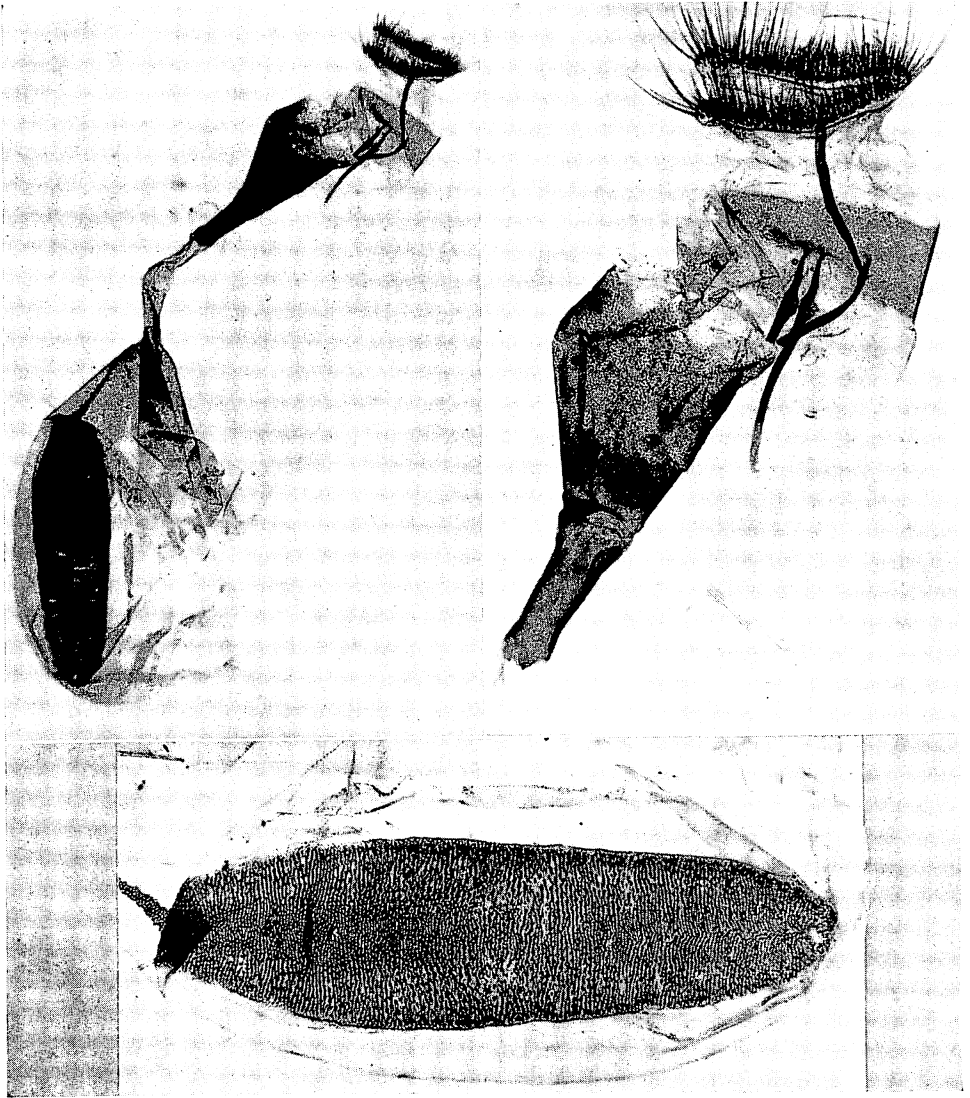


Figure 145—Female genitalia of *Oeobia bryochloris* (Meyrick); Haleakala, Maui, 5,000 feet.

***Oeobia phaethontia* (Meyrick), new combination** (figs. 91, 119, 138).

Pyrausta phaethontia Meyrick, 1899:225, pl. 6, fig. 5.

Endemic. Hawaii (type locality: Olaa).

Hostplant: Unknown.

Meyrick placed this species in *Protocolletis* in the final arrangement of his collection, and Hampson put it in *Uresiphita*.

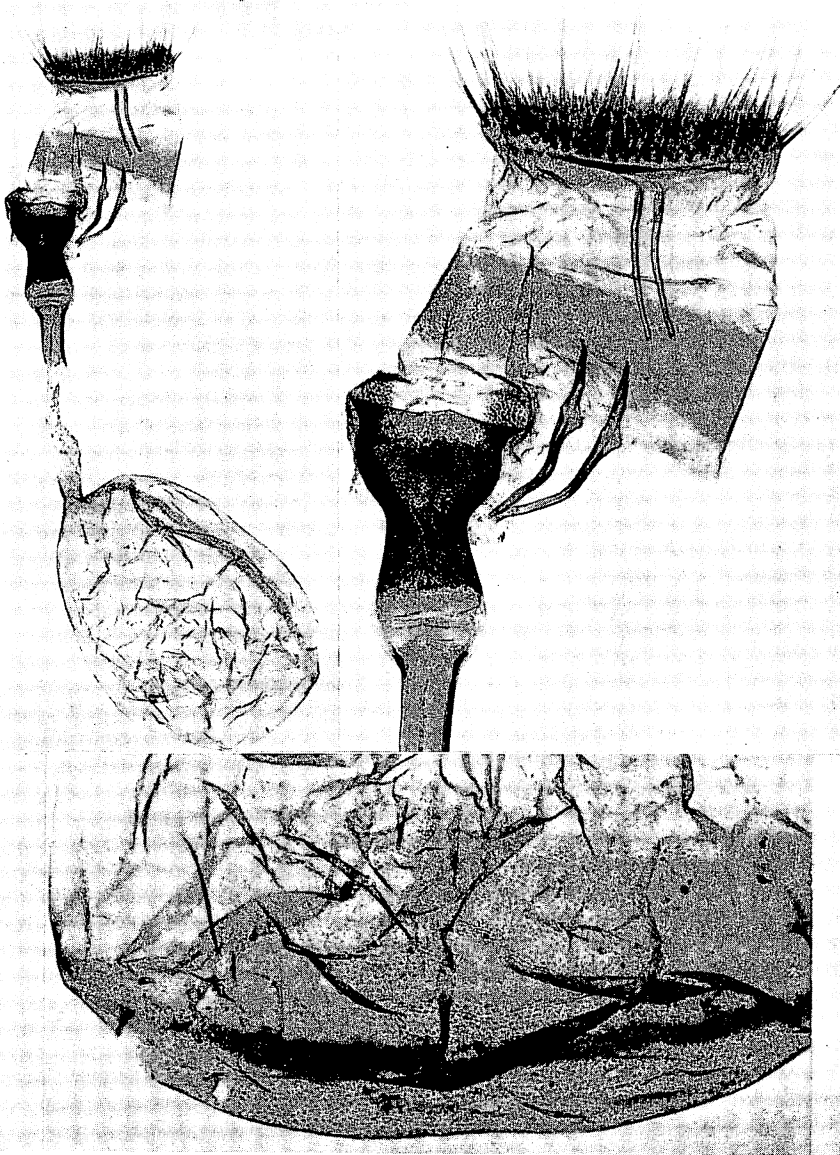


Figure 146—*Oeobia calliastra calliastra* (Meyrick), female genitalia; Kaholuamano, Kauai.

***Oeobia phyllostegia* (Swezey), new combination** (fig. 119).
Phlyctaenia phyllostegia Swezey, 1946:626.

Endemic. Oahu (type locality: Pacific Heights Ridge).

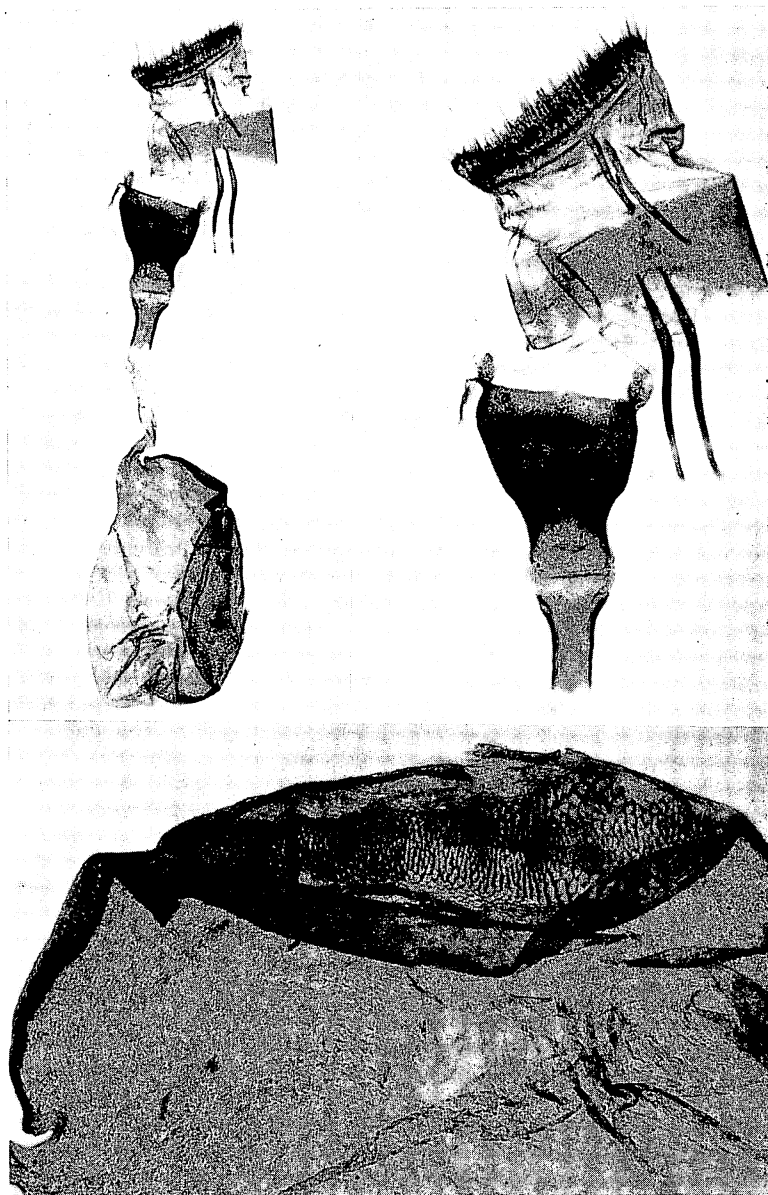


Figure 147—Female genitalia of *Oeobia calliastra hyacinthias* (Meyrick); Haleakala, Maui, 5,000 feet.

Hostplant: *Phyllostegia*.

I have not had material of this species for dissection and study while writing the final draft of this report. It is quite possible that it is a form of *liopis*, and it may be a synonym.

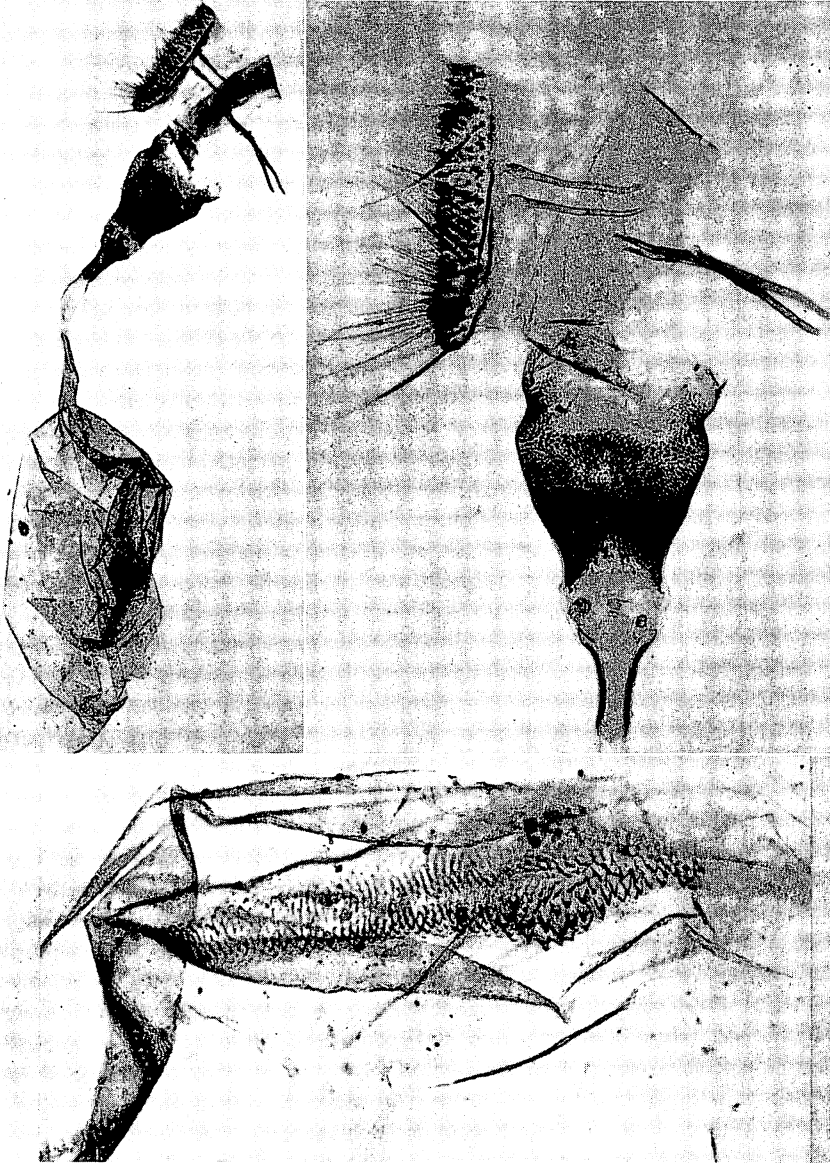


Figure 148—Female genitalia of *Oeobia calliastra synastra* (Meyrick); Kona, Hawaii.

***Oeobia platyleuca* (Meyrick), new combination** (figs. 120, 139).

Phlyctaenia platyleuca Meyrick, 1899:214; 1904:133. Swezey, 1954:218, 219.

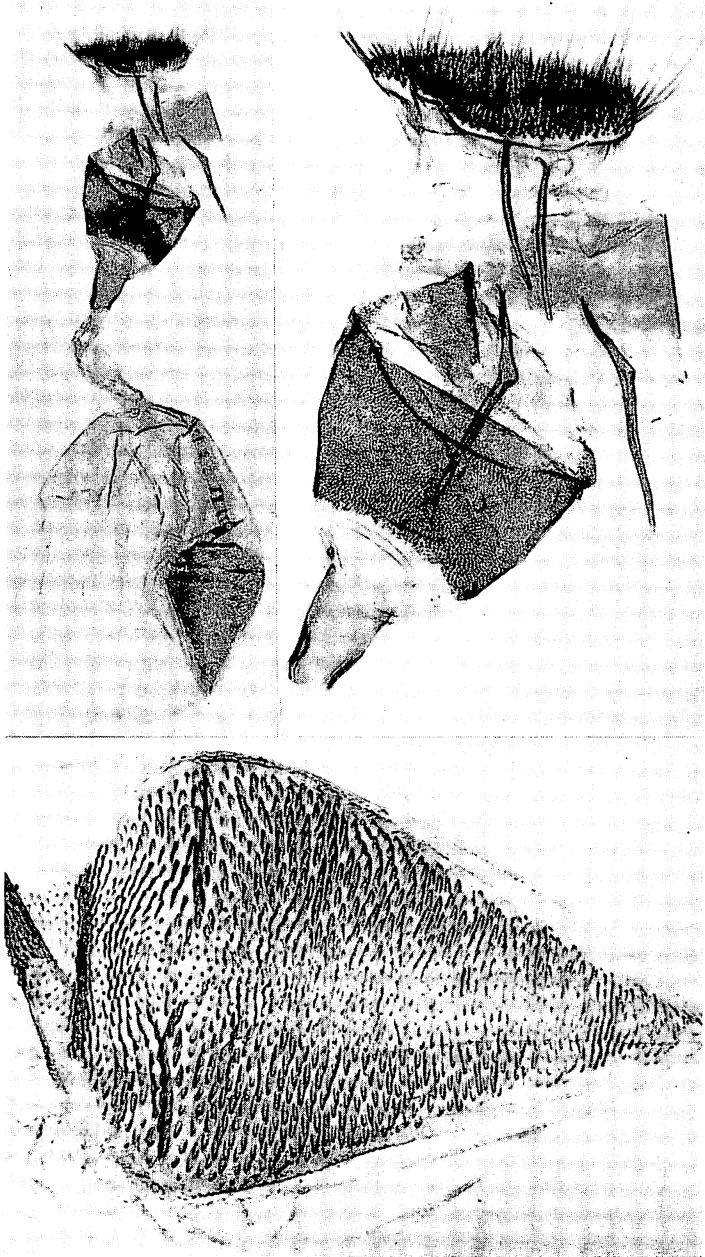


Figure 149—Female genitalia of *Oeobia caminopis* (Meyrick), type; Molokai Mts., 5,000 feet.

Endemic. Oahu, Molokai, Maui (type locality: Haleakala, 5,000 feet), Hawaii.
Hostplants: *Touchardia latifolia*, *Urera sandwicensis*.

Parasites: *Angitia blackburni* (Cameron), *Casinaria infesta* (Cresson), *Sierola*,
Zaleptopygus flavo-orbitalis (Cameron).

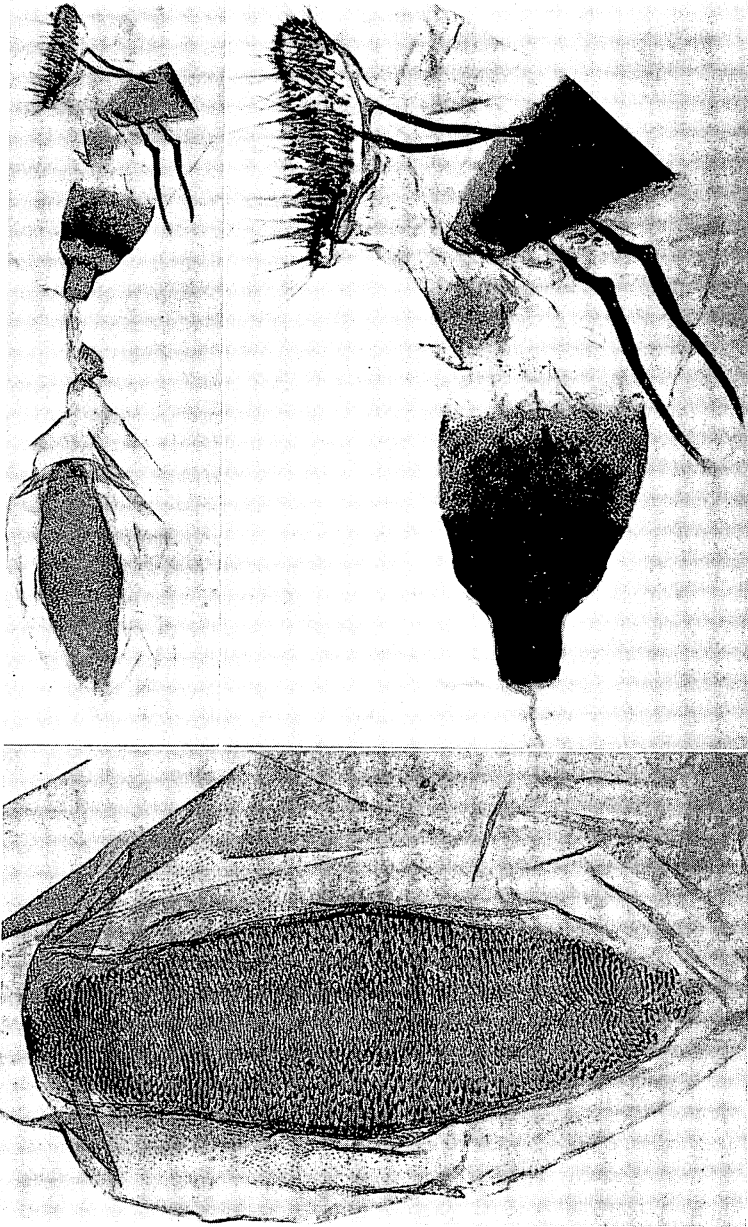


Figure 150—Female genitalia of *Oeobia cataphaea* (Meyrick); Haleakala, Maui, 6,000 feet.

Meyrick had two examples of *ephippias* mixed with this species in his collection.

"Head of caterpillar testaceous with a large brown spot dorso-laterally on each side; a large, roundish, black spot near each lateral margin of the prothoracic shield; no other distinctive markings." (Personal note from Swezey.)

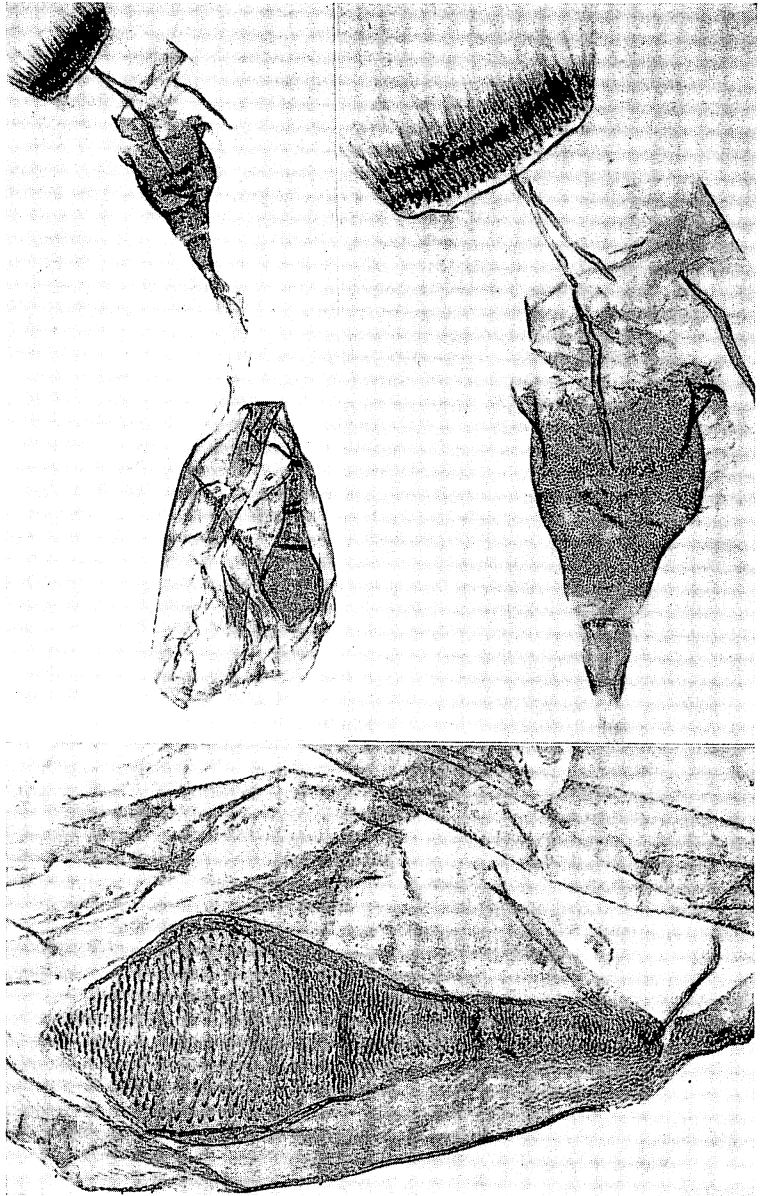


Figure 151—Female genitalia of *Oeobia chalcophanes* (Meyrick); Olaa, Hawaii, 2,000 feet.

***Oeobia psychropa* (Meyrick), new combination** (figs. 120, 139).

Pyrausta psychropa Meyrick, 1899:224, pl. 6, fig. 4.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Meyrick placed this species in *Oeobia* in the final arrangement of his collection.

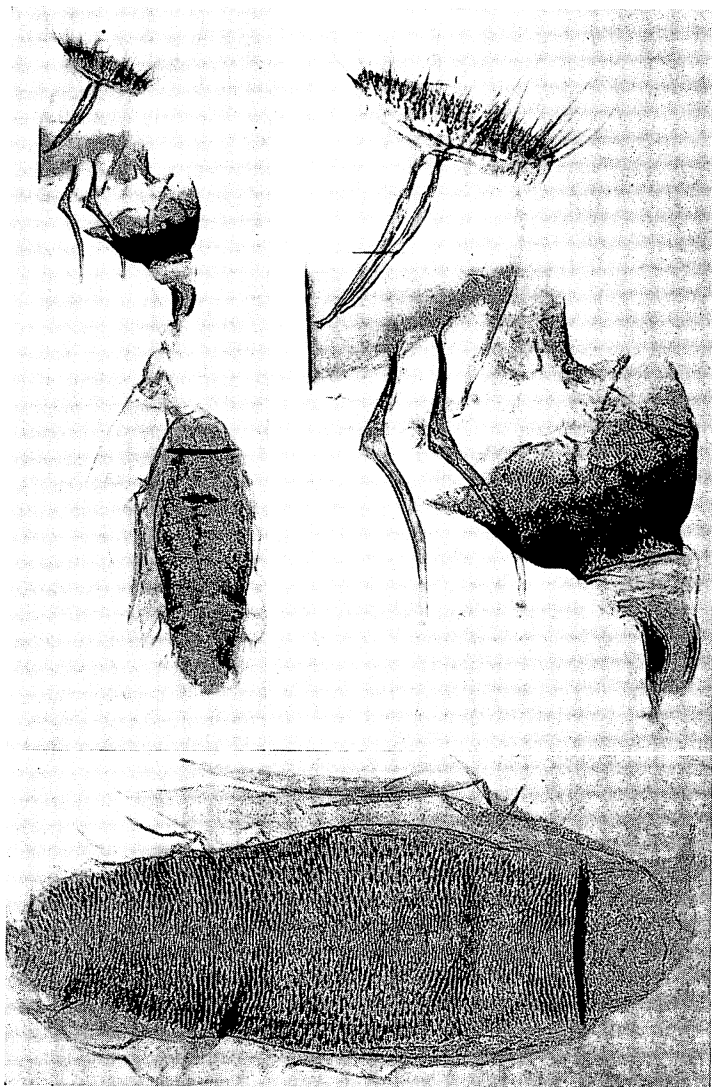


Figure 152—Female genitalia of *Oeobia chloropis* (Meyrick); Olaa, Hawaii, 2,000 feet. This example is externally closely similar to the Kauai type.

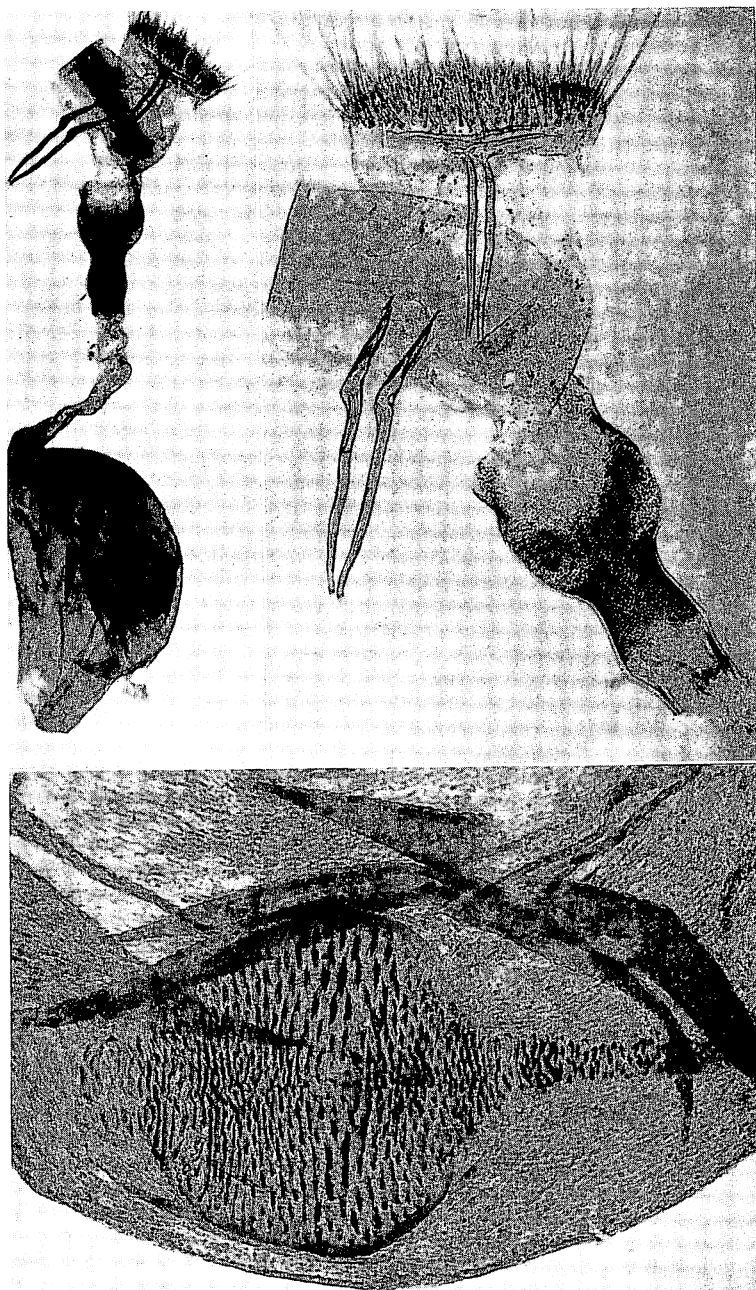


Figure 153—*Oeobia chytropa* (Meyrick), female genitalia of the type; Kauai.

Oeobia pyranthes (Meyrick), **new combination** (figs. 121, 140, 173).

Phlyctaenia pyranthes Meyrick, 1899:220, pl. 5, fig. 29. Swezey, 1954:221.

Endemic. Kauai (type locality: Waimea Mountains), Oahu, Molokai, Maui, Hawaii.

Hostplants: *Vaccinium calycinum*, *Vaccinium penduliflorum*, *Vaccinium penduliflorum gemmaceum*.

Dr. Swezey told me that the caterpillar has a pale brown head checkered with darker brown, eyes black; prothoracic shield with a blackish spot near each lateral margin and a pair of dark spots at the middle of the posterior margin; the sclerotized plates bearing the setae are darkened at the bases of the setae, and those on the meso- and metathorax are more conspicuous than those on the abdominal segments.

Oeobia stellata (Butler), **new combination** (figs. 121, 140, 174).

Melanomecyna stellata Butler, 1883:179. Meyrick, 1899:216, in synonymy.

Scopula stellata (Butler) Meyrick, 1888:222.

Pionea stellata (Butler) Hampson, 1899:244.

Phlyctaenia stellata (Butler) Meyrick, 1904:359. Swezey, 1954:158.

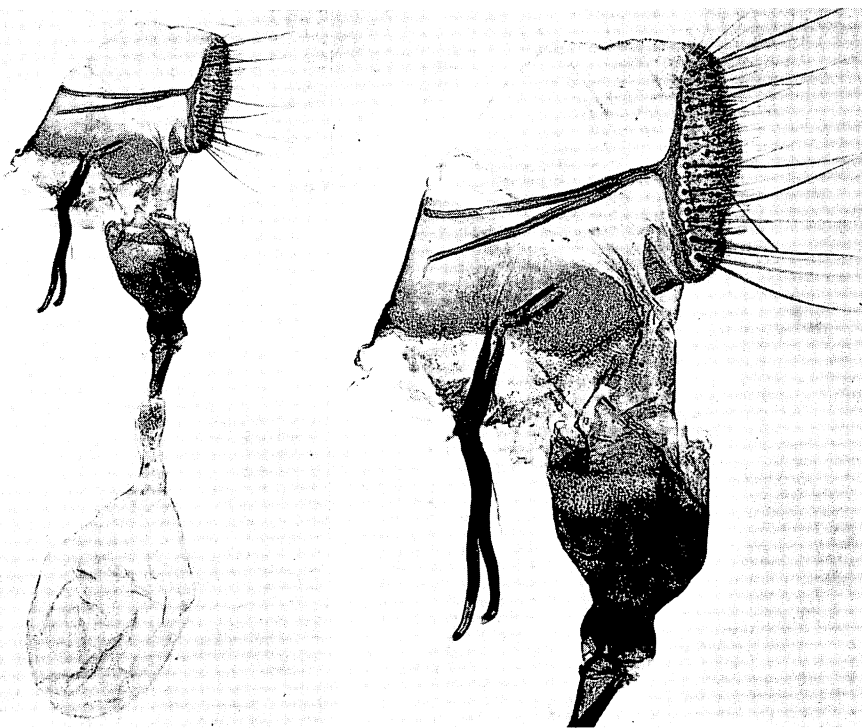


Figure 154—*Oeobia conisalis* (Meyrick), genitalia of the female type; Hilo, Hawaii, 2,000 feet.

Endemic. Kauai, Oahu (type locality: "on the mountains of Oahu"), Molokai, Hawaii.

Hostplants: *Neraudia melastomaefolia*, *Pipturus albidus*.

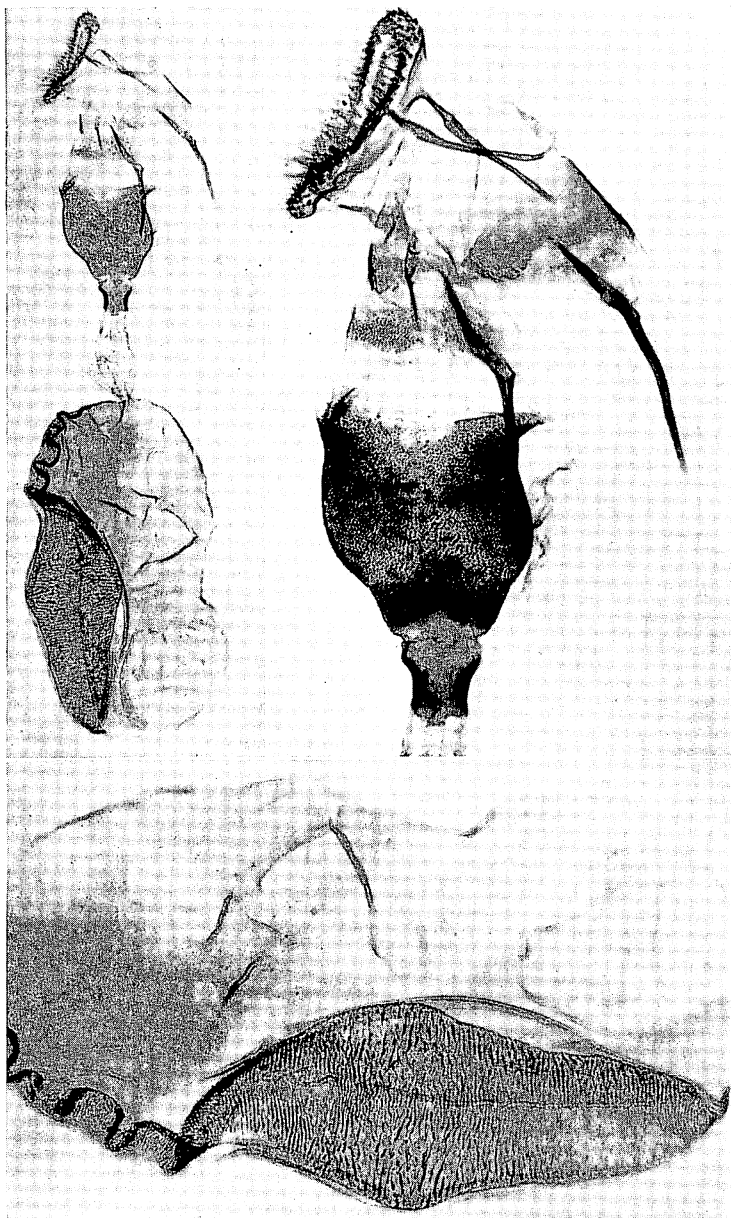


Figure 155—*Oeobia constricta* (Butler), genitalia of the female type; "Hawaiian Islands 82-9" (Blackburn).

Parasites: *Angitia blackburni* (Cameron), *Casinaria infesta* (Cresson), *Meteorus laphygmae* Viereck, *Zaleptopygus flavo-orbitalis* (Cameron).

Meyrick (1899:216) erroneously sank this species as a synonym of *ennychioides*, but he corrected his error in his 1904 supplement to his section of *Fauna Hawaiiensis*.



Figure 156—*Oeobia despecta* (Butler), female genitalia (glued to specimen) of the type; "77-43 Sandw. Islands" (Blackburn).

Dr. Swezey has given me the following observations on the larvae: "The caterpillars are pale whitish-green, head testaceous without markings except the black eyes; no conspicuous markings on the prothoracic shield or other body segments. They feed on the underside of the leaves. When small they feed singly, often in a

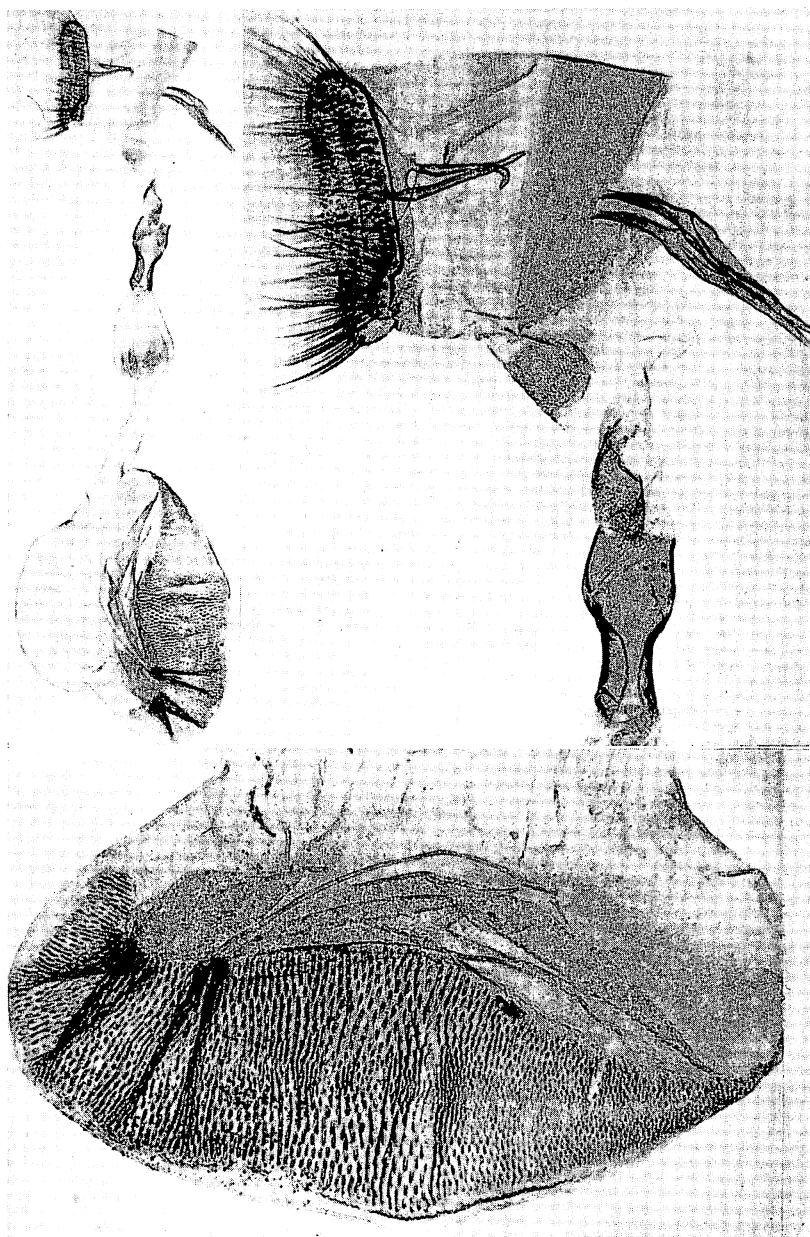


Figure 157—*Oeobia despecta* (Butler), female genitalia from an example of the synonym *Phlyctaenia campylothecae* Swezey; reared from *Bidens*; Haleauau, Oahu.

groove or unevenness of the surface or beside a rib or vein, and are protected by a web. The older caterpillars are found in folded over leaf margins."

Butler's type is a male, not a female as supposed. It is in poor condition.

***Oeobia swezeyi* (Zimmerman), new combination** (figs. 91, 122, 141, 175).

Protaulacistis swezeyi Zimmerman, 1951:337, figs. 1, 2, 3.

Endemic. Kauai (type locality: Kokee).

Hostplant: Unknown.

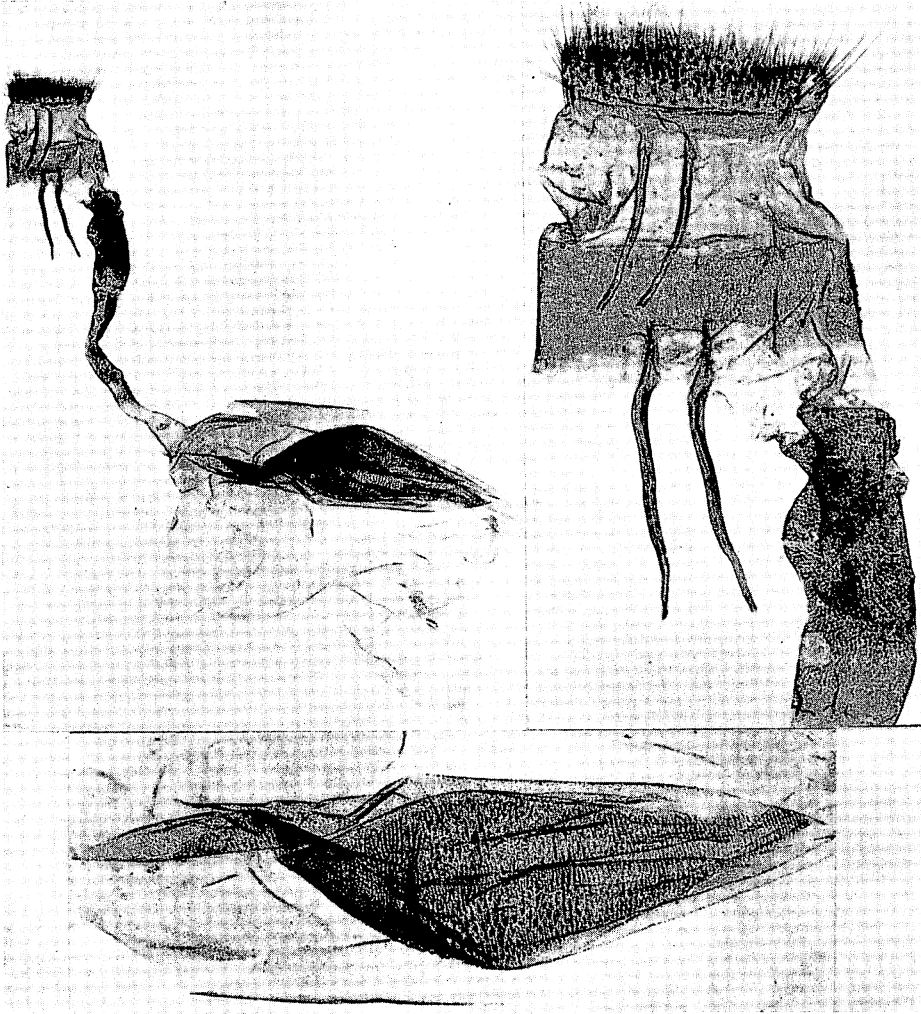


Figure 158—Female genitalia of *Oeobia ennychioides* (Butler); Molokai Mts.; the sclerotization of the ductus bursae is, unfortunately, folded.

When I described this species in *Protaulacistis*, I believed that that was the genus to which our Hawaiian species of this complex eventually would be transferred.

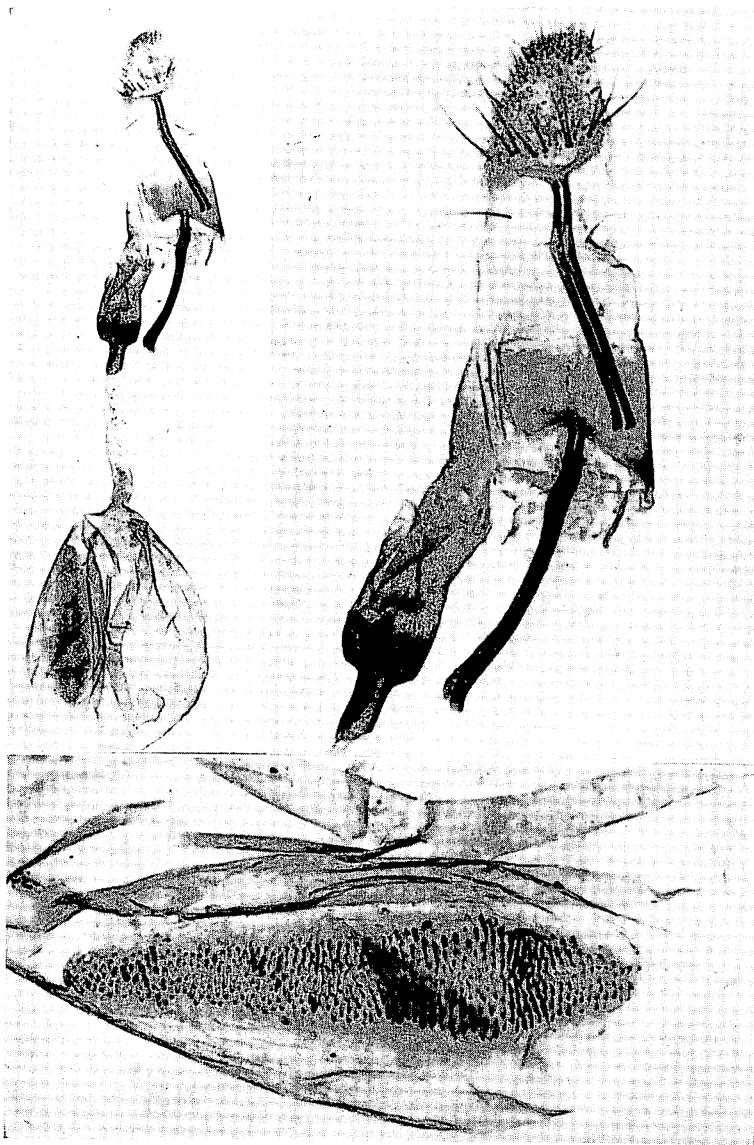


Figure 159—*Oeobia eucrena* (Meyrick), female genitalia; Olaa, Hawaii. Note the unusual ovipositor in this species and compare with figures of other species.

Oeobia thermantis (Meyrick), new combination (figs. 123, 141, 176).

Pyrausta thermantis Meyrick, 1899:223, pl. 6, fig. 3; 1904:133.

Endemic. Kauai, Oahu, Molokai, Maui, Hawaii (type locality: Olaa).

Hostplant: *Phyllostegia*.

"Caterpillar about 18 mm. long. Head pale yellowish with brown mosaic on

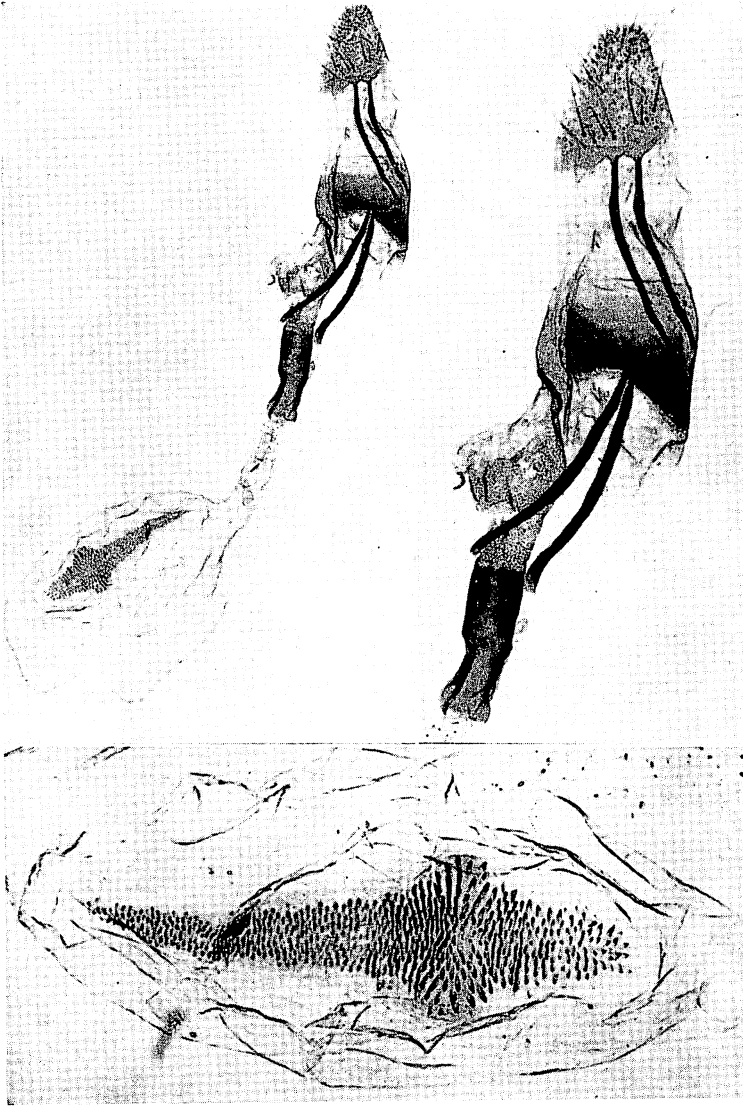


Figure 160—Female genitalia of *Oeobia eucrena* (Meyrick) from the type of the synonym *Pionea leucozonea* Hampson. The sclerotized section of the ductus bursae is viewed from the side; compare figure 159.

upper half, a small black dot in middle of each lobe in front; eyes black. Prothoracic shield with dark lateral margins and a large, blackish, longitudinal bar near each lateral margin. On all of the body segments the sclerotized plates bearing the setae are all conspicuously embrowned. Spiracles circular, pale brown." (Personal note from Swezey.)

Meyrick placed this species in *Oeobia* in the final arrangement of his collection, but he never published such a combination.

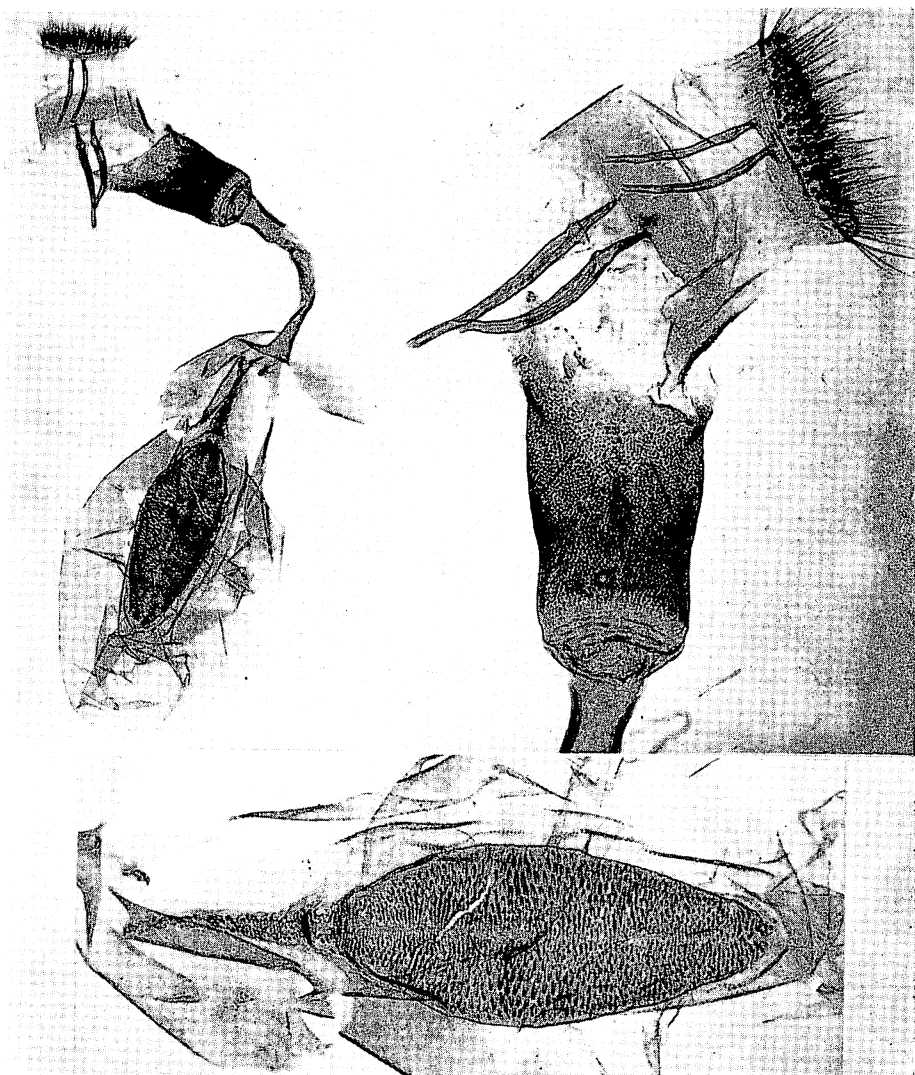


Figure 161—*Oeobia ephippias* (Meyrick), female genitalia; Molokai, 4,000 feet.

***Oeobia thermantoides* (Swezey), new combination, emendation** (figs. 123, 142).

Pyrausta thermantoidis Swezey, 1913:273 (typographical error).

Endemic. Hawaii (type locality: Kilauea).

Hostplant: Unknown.

From the name, one would conclude that this species was quite like *thermantis*, but it is a distinct form.

***Oeobia violae* (Swezey), new combination** (figs. 124, 142).

Phlyctaenia violae Swezey, 1933:299.

Endemic. Oahu (type locality: Puu Kanehoa, Waianae Mountains).

Hostplant: *Viola*.

Parasite: *Zaleptopygus flavo-orbitalis* (Cameron).

"The full-grown . . . larva was 20 mm.; light green, with white dorsal fat bodies showing through. Head plate testaceous with slight browning on the sides, eyes

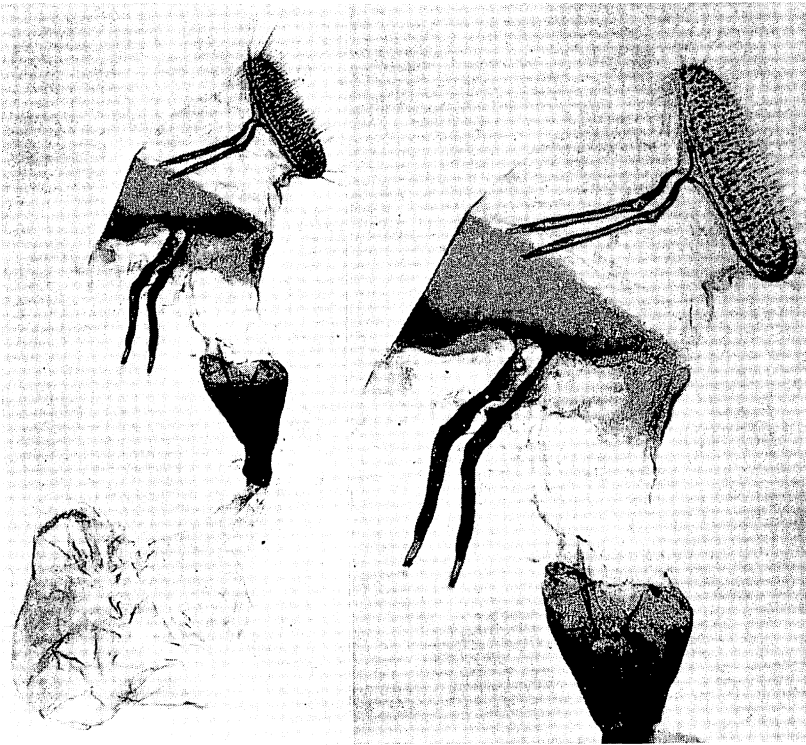


Figure 162—Female genitalia of a paratype of *Oeobia helioxantha* (Meyrick); Kaholuamano, Kauai.

black. A black longitudinal bar on each lateral margin of cervical plate. The larva spun up between leaves, and the pupa was formed February 19, from which the adult moth issued March 3, 26 days from the date of capture, February 5." (Swezey, 1933:300).

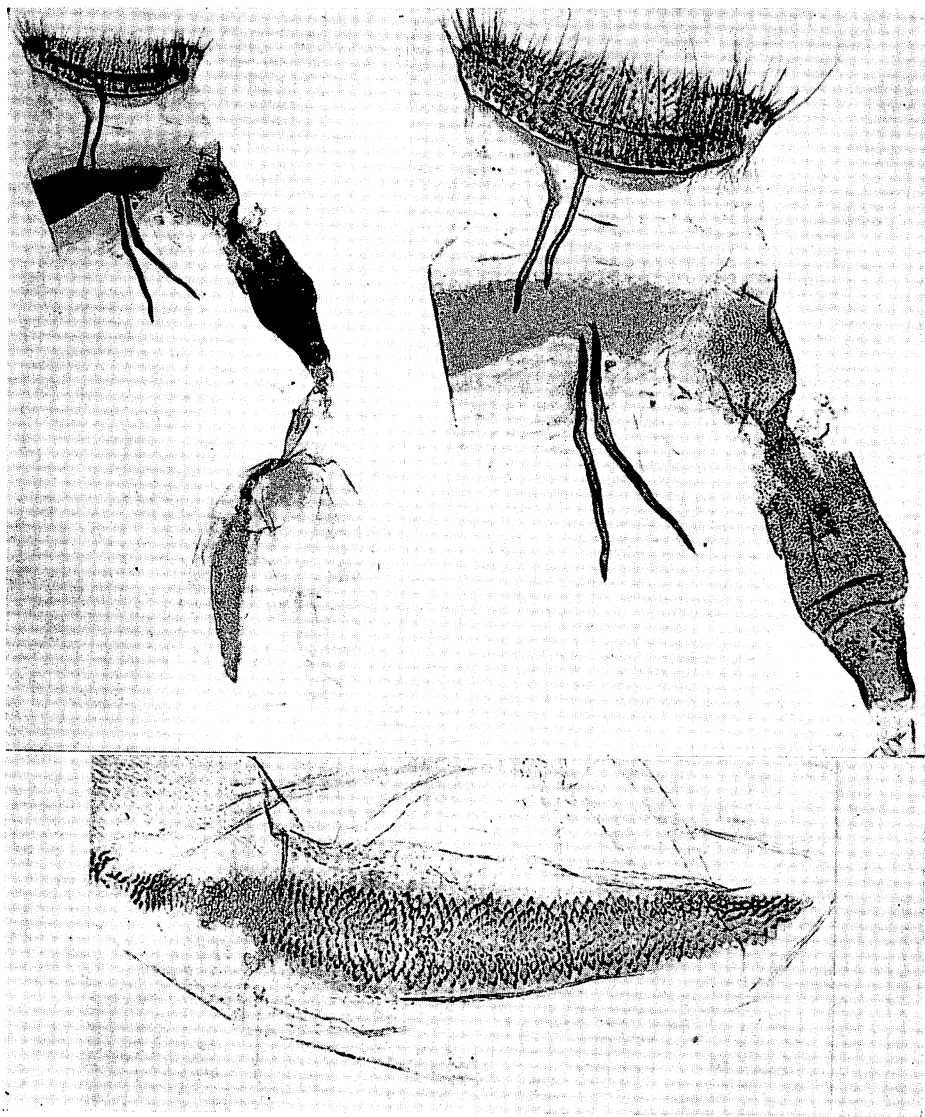


Figure 163—Female genitalia of *Oeobia heterodoxa* (Meyrick); Haleakala, Maui, 5,000 feet.

Subfamily SCOPARIINAE

Scoparidae Guenée, 1854:412.

Scopariadae Meyrick, 1884:342.

Scopariinae Ragonot, 1890:445, 446, 453.

In most texts and keys, this subfamily is said to be characterized by "raised scales" in the cell of the fore wing, or the fore wing is described as "rough scaled" or with "raised scales." This character has been repeated almost *ad nauseam*,

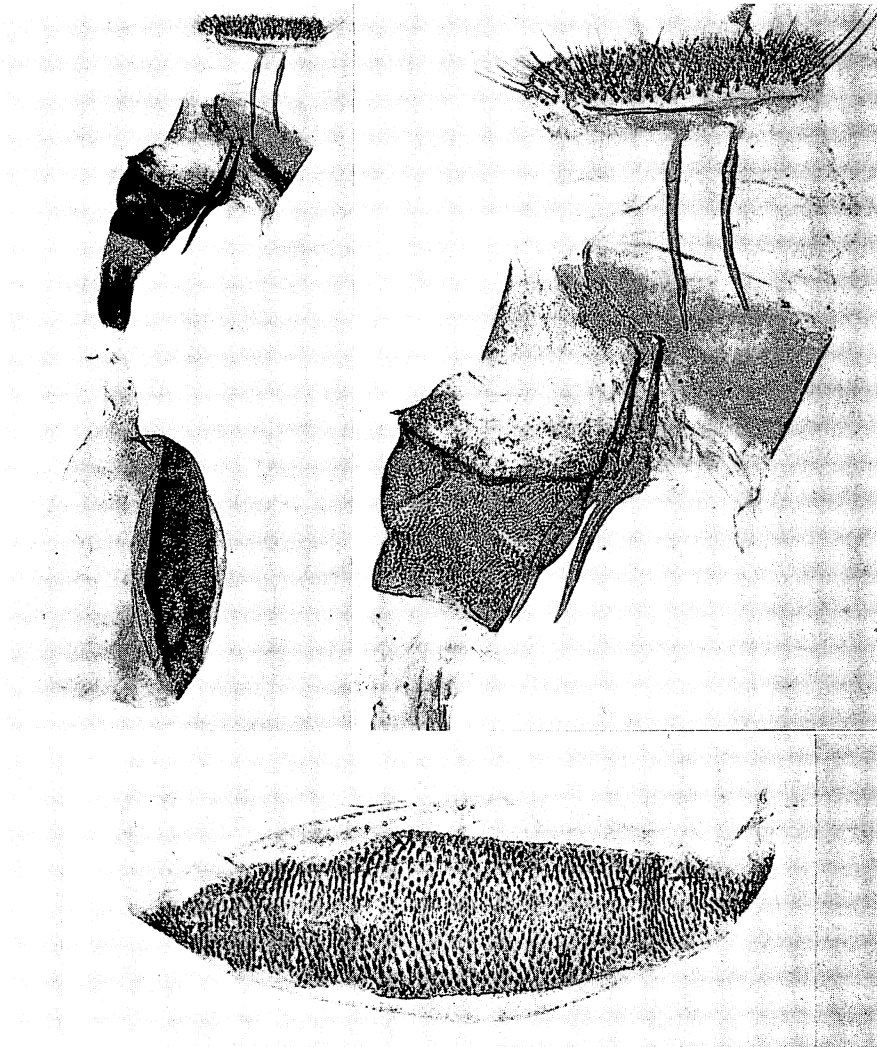


Figure 164—Female genitalia of *Oeobia lampadias* (Meyrick), lectotype; Kilauea, Hawaii.

apparently without checking. Some species may have such scales, but the Hawaiian forms, and many species found elsewhere, do not have raised scales. Ocelli and chaetosemae are present.

The group appears to be a rather primitive one. Only one genus of the subfamily is established in Hawaii.

Klima (1937:7) has prepared a world catalogue of the subfamily.

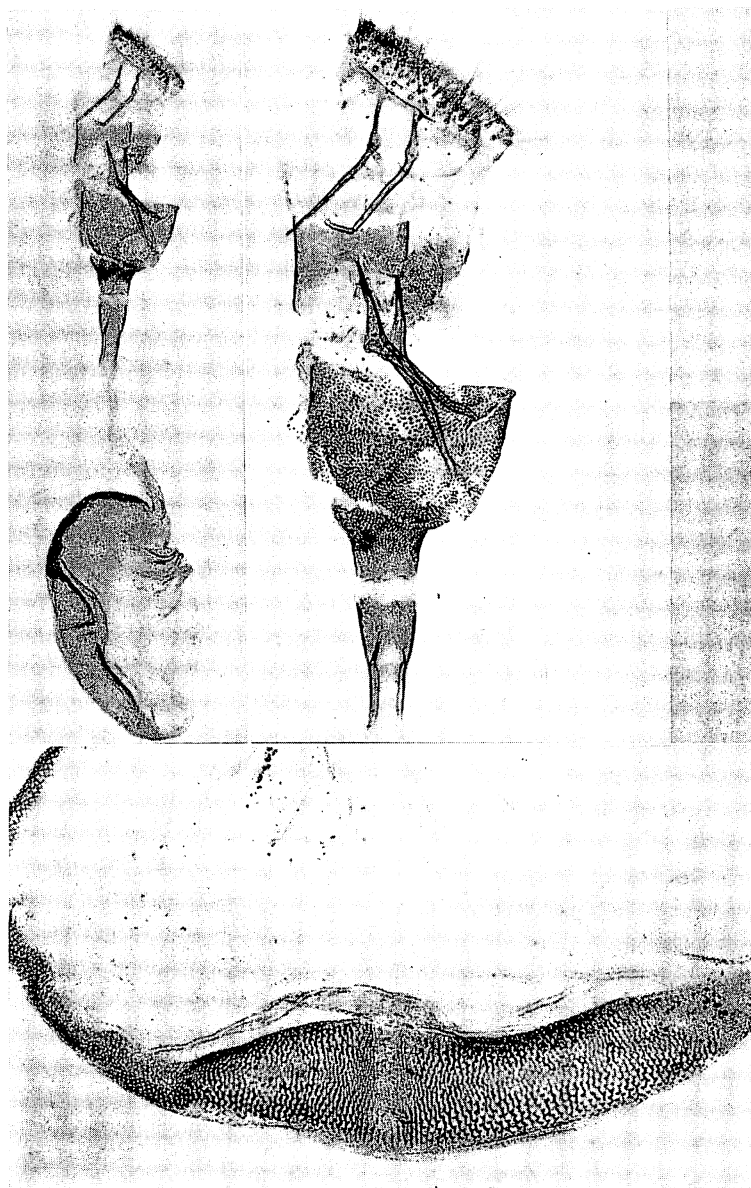


Figure 165—Female genitalia of *Oeobia liopis* (Meyrick); Haleakala, Maui, 5,000 feet.

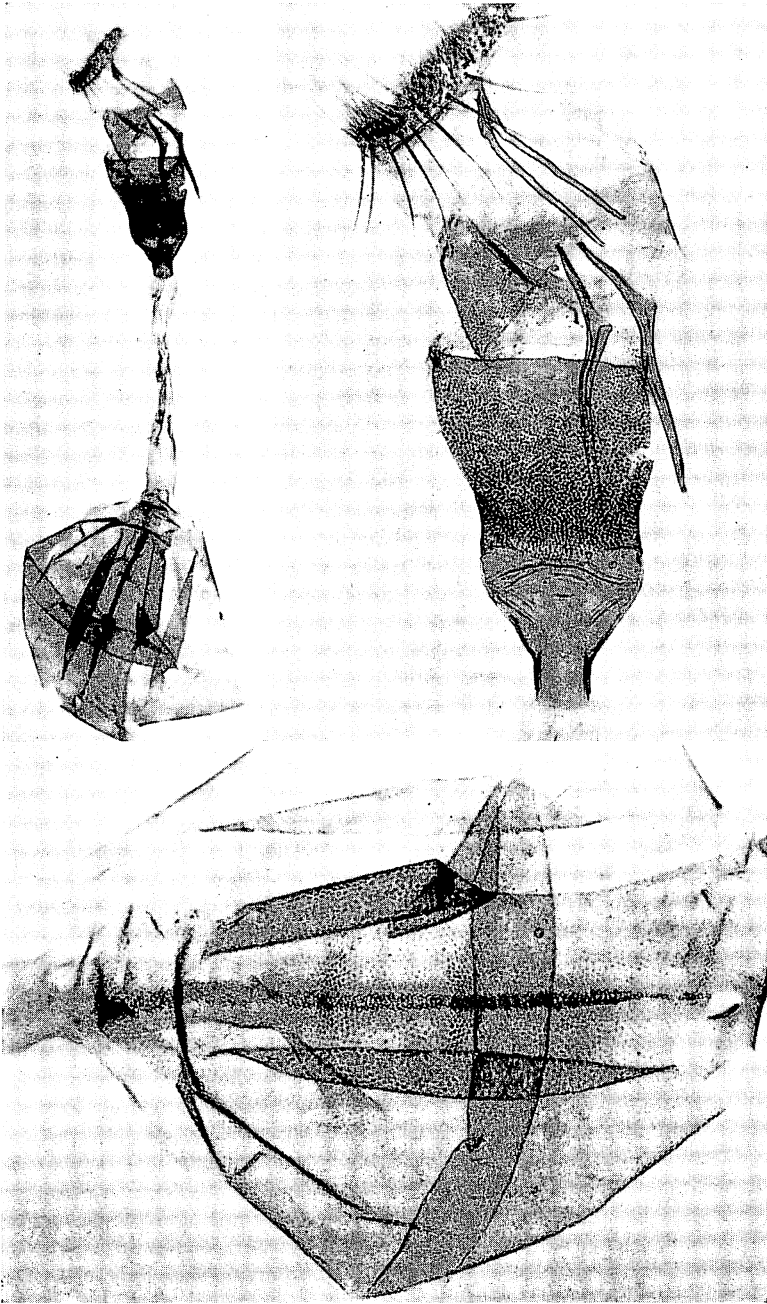


Figure 166—Female genitalia of the type of *Oeobia liopis rhodias* (Meyrick); Lanai, 3,000 feet.

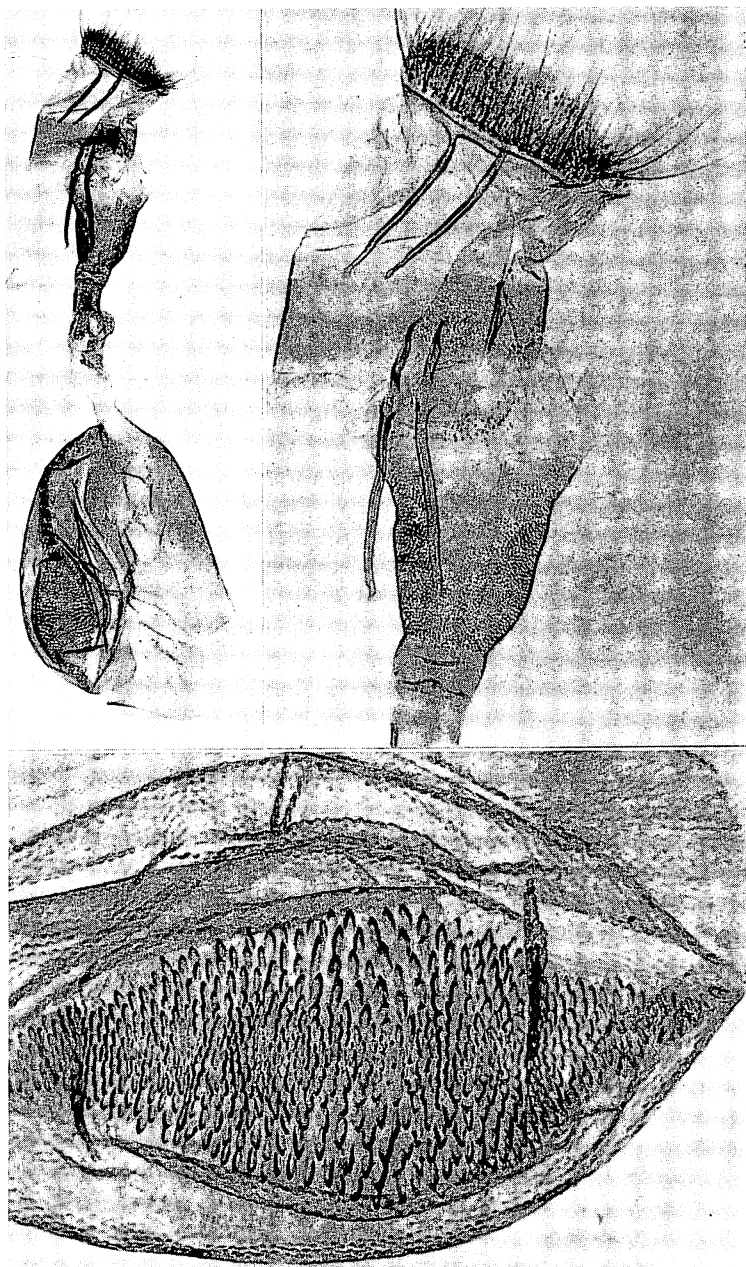


Figure 167—Female genitalia of *Oeobia lilorea* (Butler) from the type of the synonym *Pionea poliochroa* Hampson; Waialua Coast, Oahu.

Genus **SCOPARIA** Haworth, 1811

Xeroscopa Meyrick, 1884:349; 1888:232; 1899:246. Hampson, 1897:225.

This is a nearly cosmopolitan genus of more than 400 species. The area of

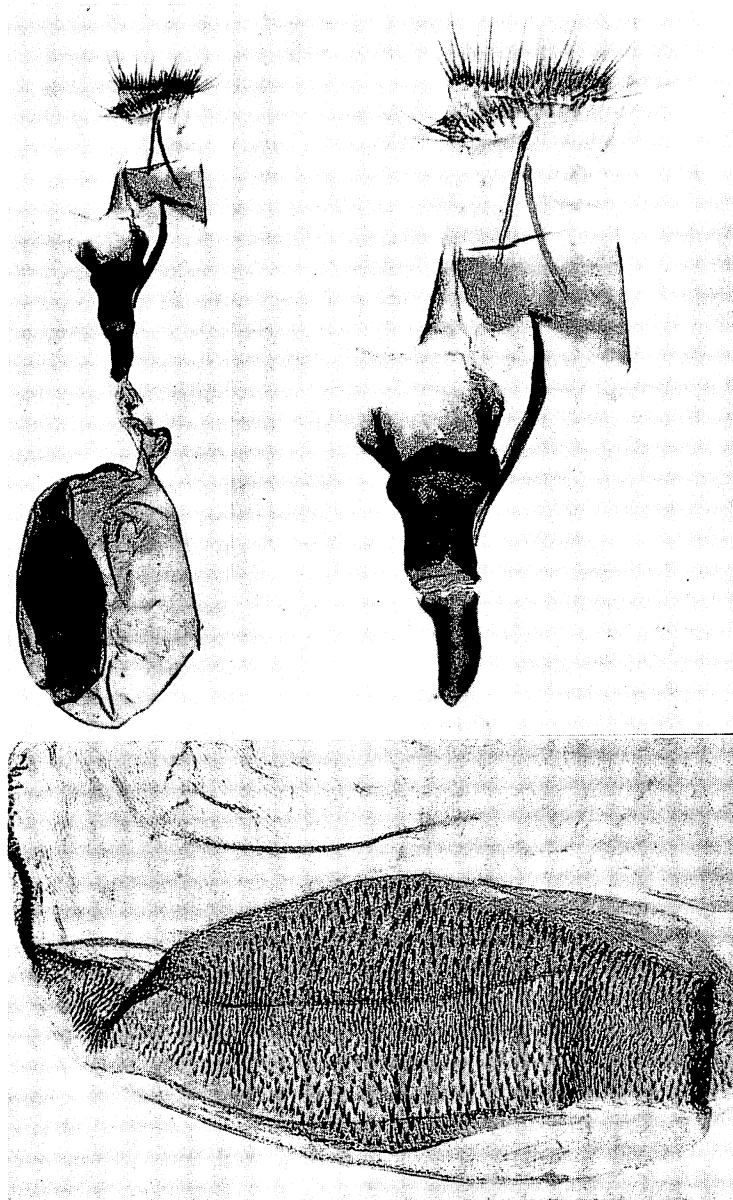


Figure 168—*Oeobia metasema* (Meyrick), female genitalia; Olaa, Hawaii.

greatest known development of the genus is New Zealand, where there are more than 125 species; it is the largest genus of Lepidoptera in New Zealand. Perhaps Hawaii, with its 61 forms, ranks next to New Zealand in number of species. I believe that the number of Hawaiian species could be increased considerably if someone would concentrate attention on the group. Meyrick (1934:334, and

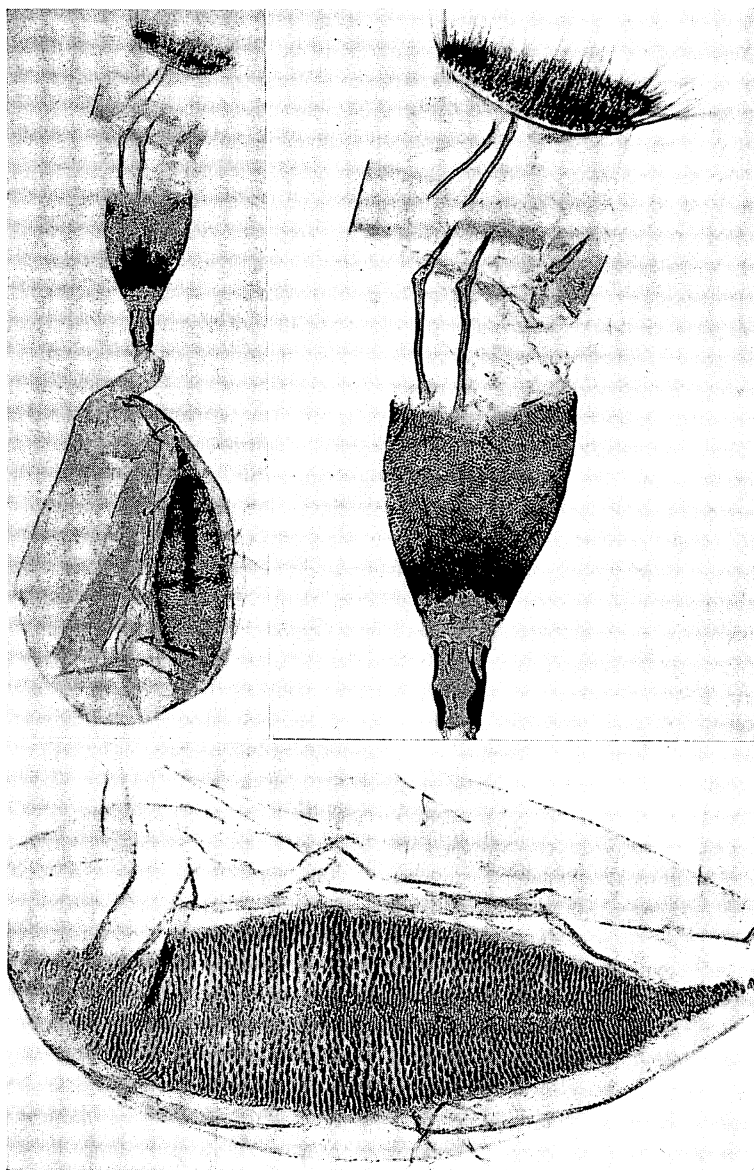


Figure 169—Female genitalia of *Oeobia micacea* (Butler); Waimea Mts., Kauai, 4,000 feet. This specimen is closely similar to the type.

elsewhere) has pointed out the similarity of types between the Hawaiian and Marquesan *Scoparia*.

Meyrick (1888:233–238) transferred four of the species of Hawaiian *Scoparia* previously described by Butler from Blackburn's collecting, plus five new ones, to his genus *Xeroscopa*. He left Butler's *frigida* in *Scoparia*, and he added his

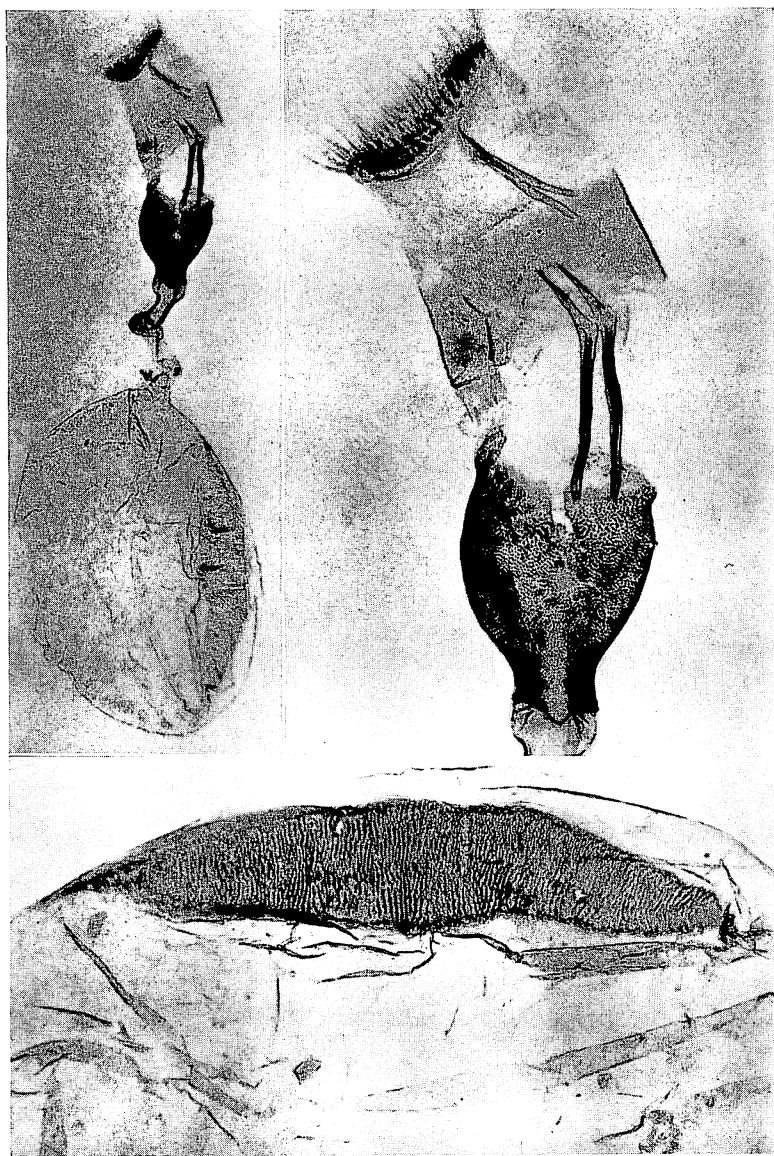


Figure 170—Female genitalia of the type of *Oeobia monticolans* (Butler); "Hawaiian Isls. 82–9 (158)" (Blackburn).

macrophanes as a new species in that genus. He also gave a key to the 10 species. In *Fauna Hawaiiensis* (1899:246) he stated "I have recently come to the conclusion that *Xeroscopa* cannot be advantageously maintained as distinct from *Scoparia*, the point of distinction being so slight and sometimes hardly appreciable, whilst in other respects, structural and superficial, there is no difference at all.

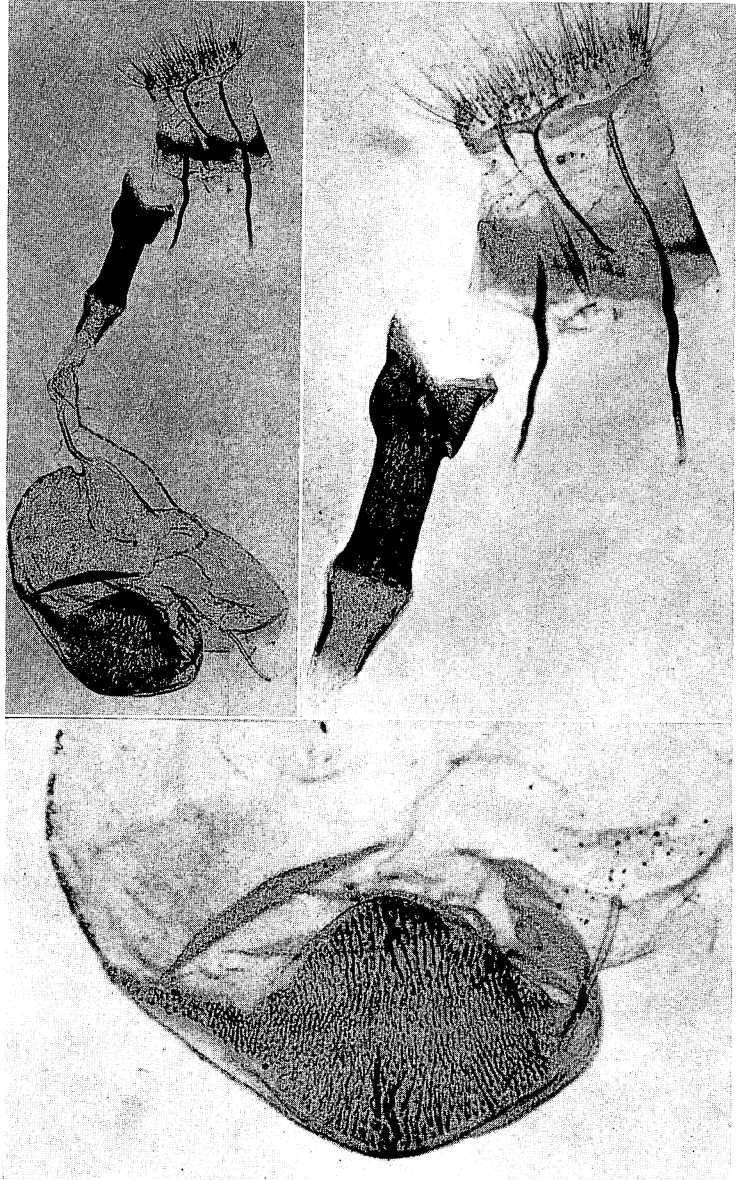


Figure 171—Female genitalia of the type of *Oeobia nigrescens* (Butler); "Hawaiian Islands 81-7 136" (Blackburn).

Probably all of the following species show more or less of the discal hairs characteristic of *Xeroscopa*, though in some cases they are apparently reduced to the merest rudiment. All the species have the forewings comparatively narrow, some very narrow." In his 1888 paper he differentiated *Xeroscopa* and *Scoparia* as follows: Hind wings with some long hairs in disc within cell . . . *Xeroscopa*. Hind wings without long hairs in disc within cell . . . *Scoparia*.

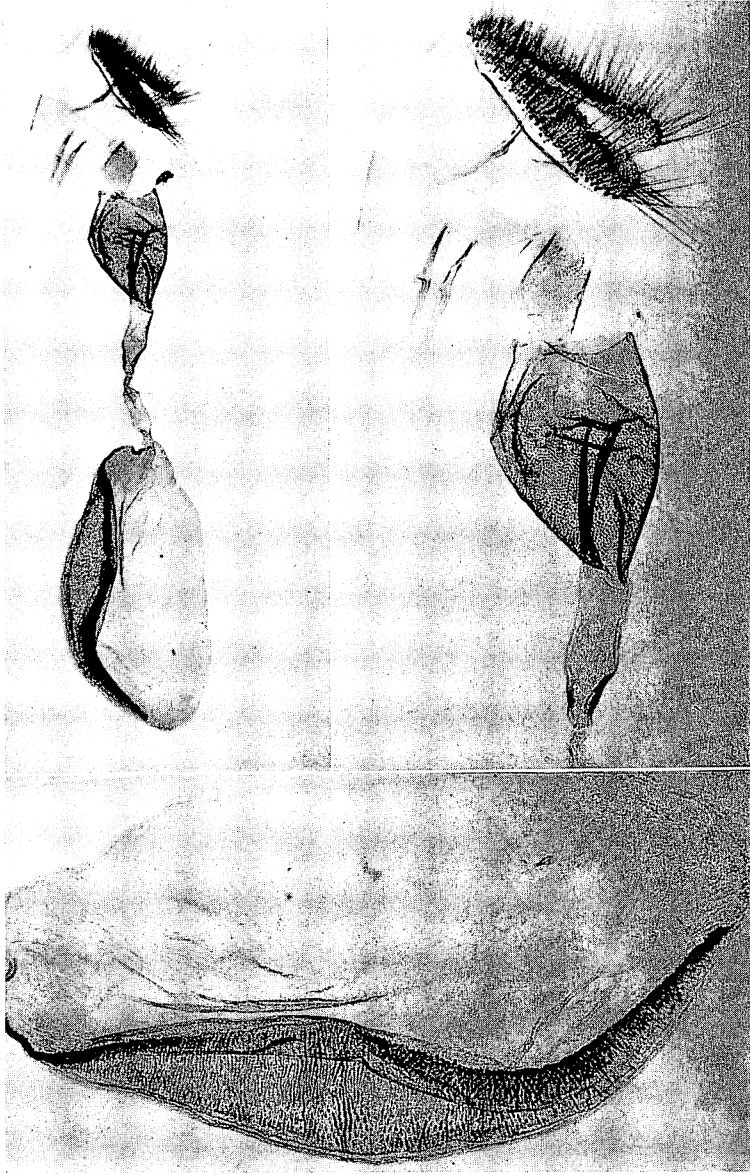


Figure 172—Female genitalia of the type of *Oeobia pachygramma* (Meyrick); Waianae Mts., Oahu, 2,000 feet.

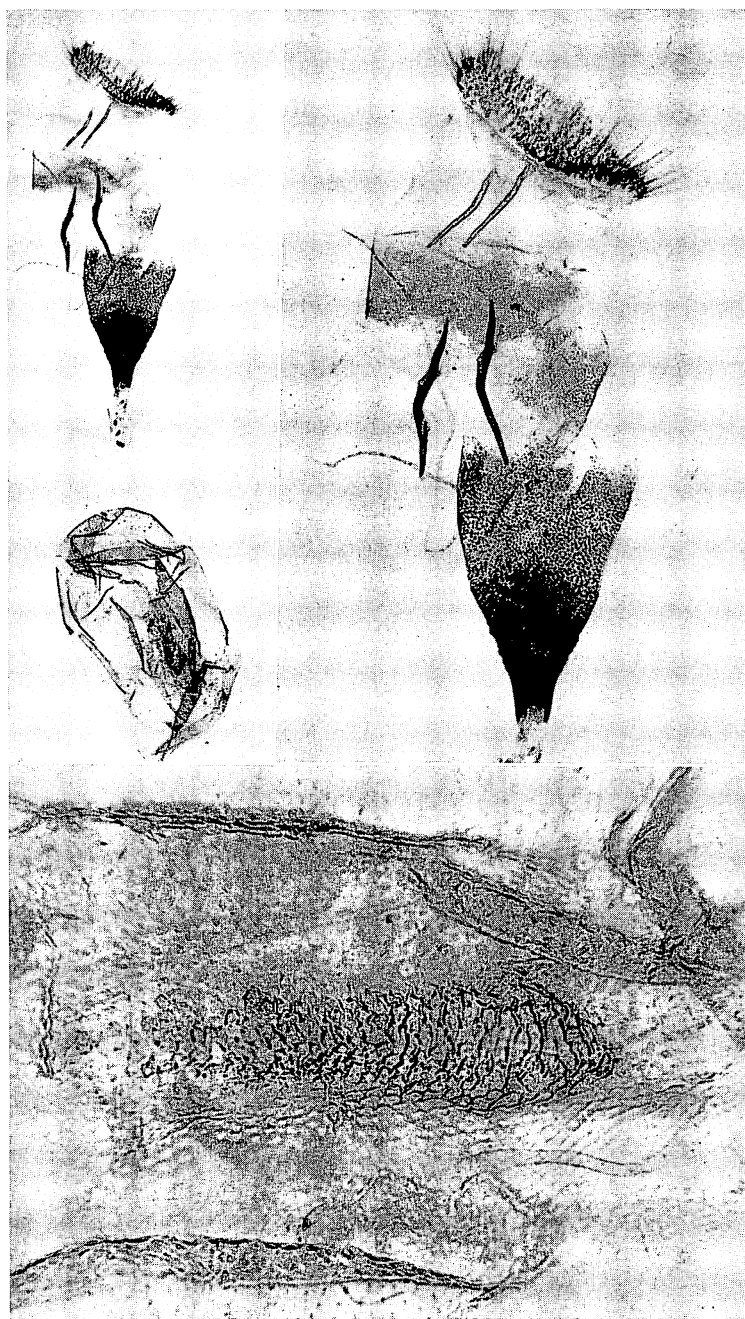


Figure 173—Female genitalia of *Oeobia pyranthes* (Meyrick); Waimea Mts., Kauai, 4,000 feet.

The following observations on *Scoparia* by Perkins (1913:clxii) are of interest here:

They occur from the lowlands on the windward side to an elevation far above the forest-line on both sides of the highest mountains, but, except accidentally, are not found on the lowlands of the leeward sides. They are most numerous represented in the true forest-belt. As in other

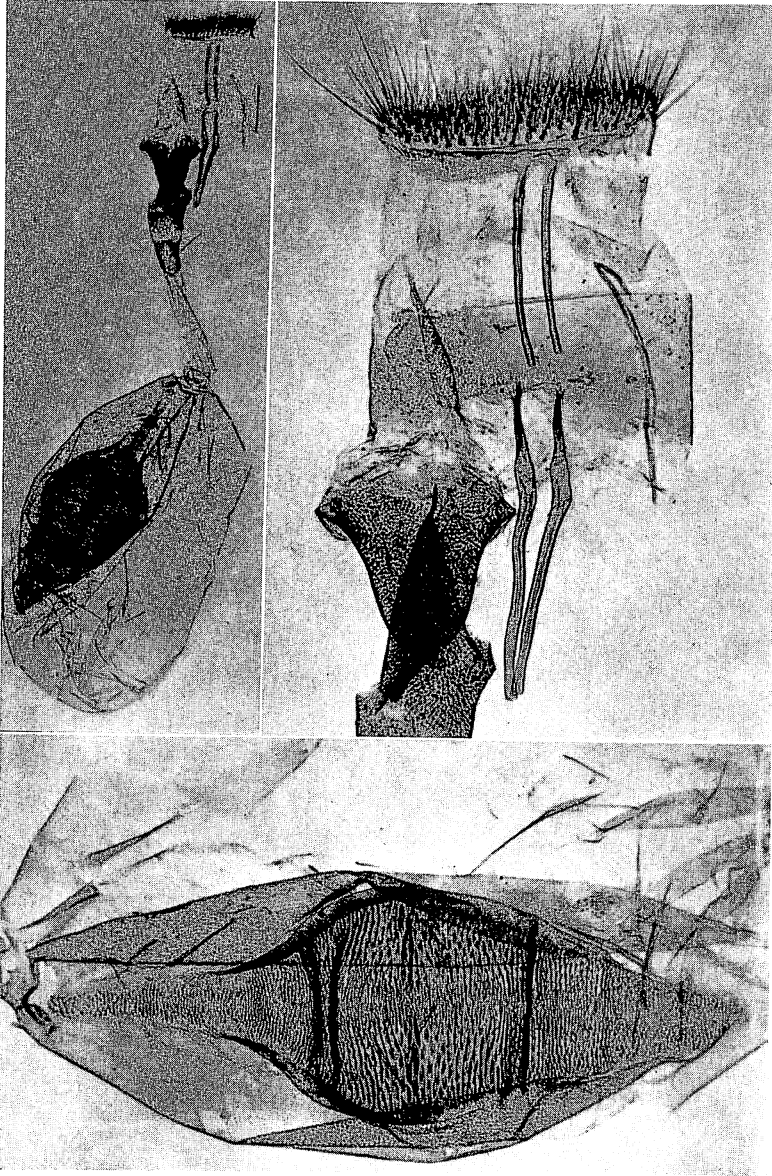


Figure 174—Female genitalia of *Oeobia stellata* (Butler); northwestern Koolau Mts., Oahu.

countries, they rest in the daytime on the trunks of trees and on rocks, but are easily disturbed, as one walks along. Some settle freely on the ground, in open parts of the forest, where there is a great growth of lichens amongst low-growing plants, such as *Vaccinium*, *Cyathodes*, and *Coprosma*. Many match in colour the lichen growths, that cover the branches and trunks of trees, on which they rest; but, as stated, they are so easily disturbed in the daytime that they are frequently snapped up by the fan-tailed flycatchers (*Chasiempis*) which, but for this habit, they might elude. In dense damp forests, where moss covers the trunks of trees, species with orange, yellow, or fer-

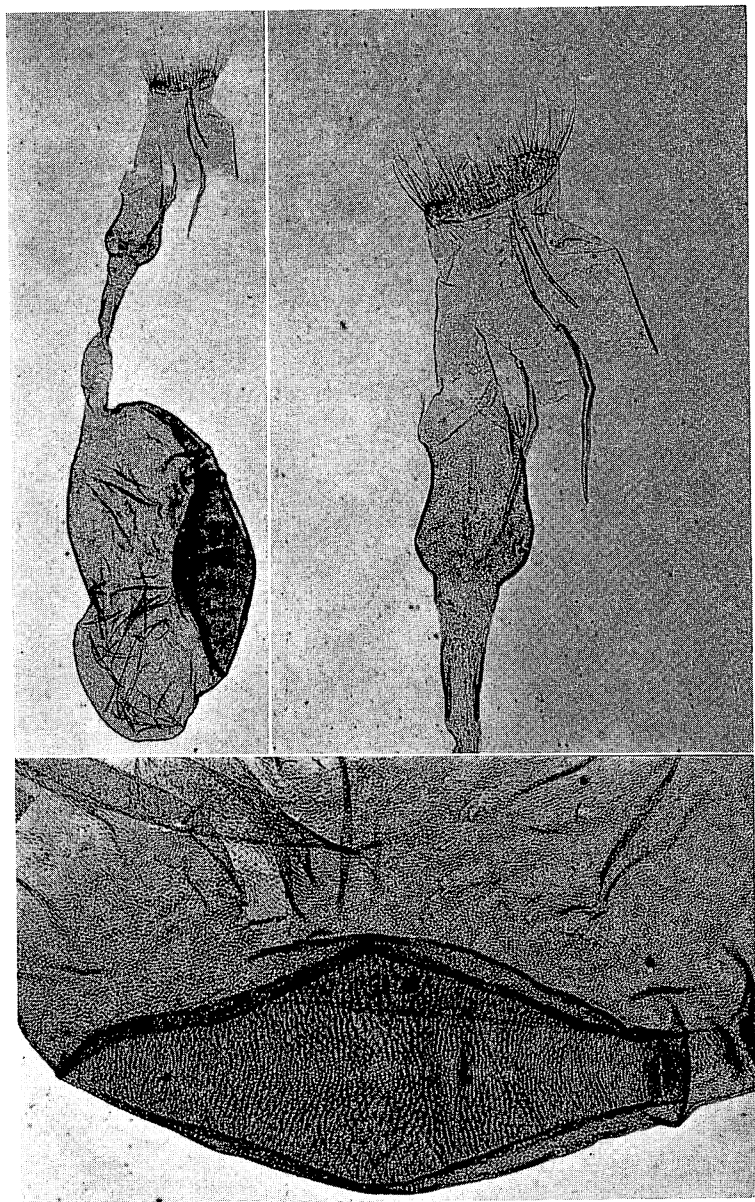


Figure 175—Female genitalia of the allotype of *Oeobia swezeyi* (Zimmerman); Kokee, Kauai.

ruiginous colour (*S. ianthes*, *marmarias*, *nectarias*, *hawaiiensis*, etc.) are conspicuous; in drier and more open places, black and white species with sharply defined markings (*S. balanopis*, etc.) are often numerous, mixed with the dull and difficult species of the group of *S. meristis*, and the very distinct looking *S. venosa*.

The caterpillars of *Scoparia* feed on mosses and possibly also on lichens. Those of species of the *meristis* group are sometimes numerous beneath moss growing on perpendicular banks or road cuttings. They are much attacked by *Limnerium blackburni*, which may be seen flying along such

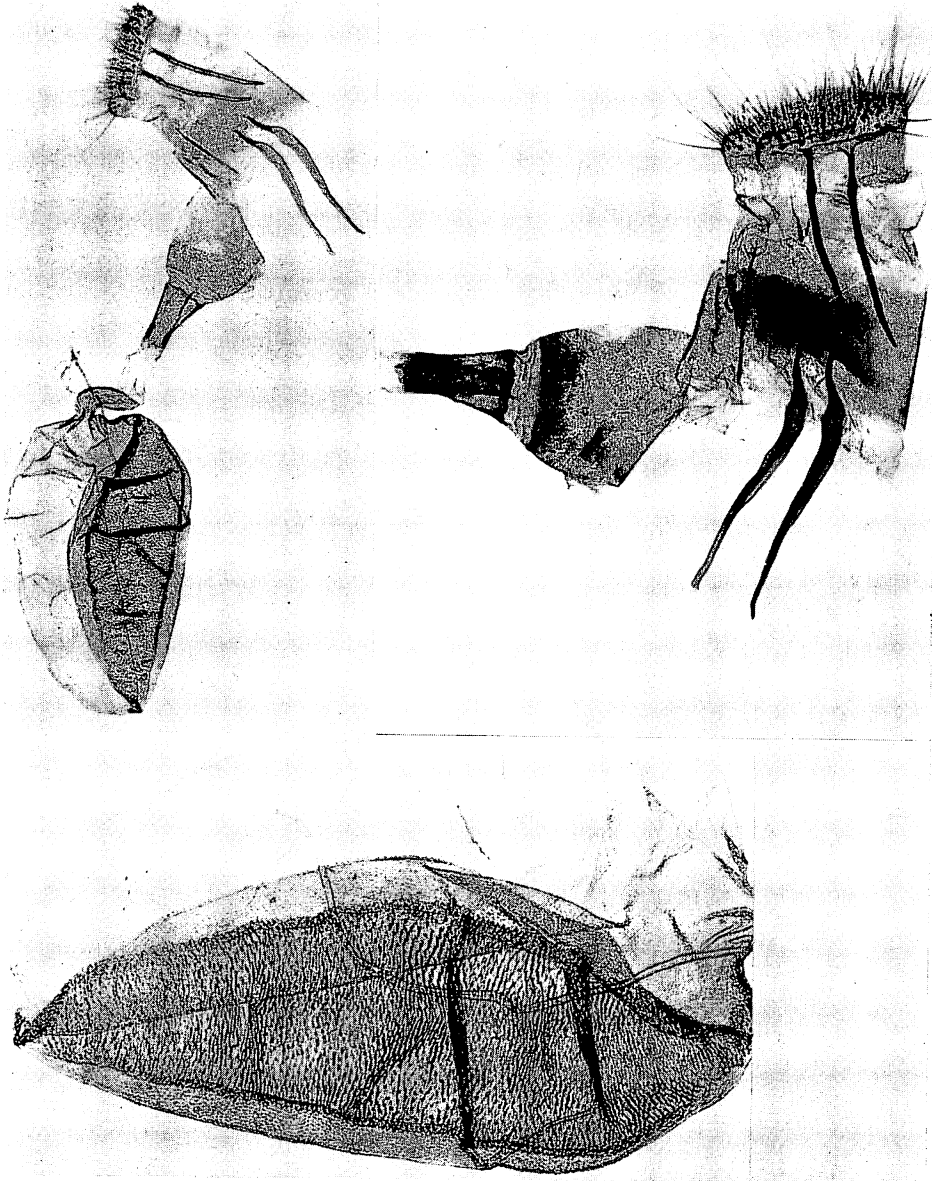


Figure 176—Female genitalia of *Oeobia thermantis* (Meyrick); Molokai, 4,000 feet.

banks in great numbers, and frequently settling and thrusting its ovipositor through the moss. Other species feed on the mosses growing upon the trunks of trees. Some above the forest-line on rock, on which mosses and lichens grow together. . . . Besides the flycatchers, *Oreomyza* and *Heterorhynchus* have been seen to catch the moths. The great abundance of individuals of many species is noteworthy, hundreds of specimens being seen around the lights at night in many places. Equally plentifully others are disturbed in open places in the forest region, as one walks along; while in some forests they fly off from every tree-trunk.

This is one of the most difficult and poorly known groups of Hawaiian insects. Obviously, there is a very large number of species in our islands. Many of them are distinctive-appearing species, but others are obscure and ill-defined, as an examination of the illustrations will reveal. It has come as a great shock and disappointment to discover that the genitalia of the Hawaiian species display no characters of specific importance. It is, indeed, astonishing to find that the genitalia are so constant as to appear as if they were all made in the same mold. Even species which are extremely different in external appearance, and those which have widely divergent habits have similar genitalia. We have, then, no recourse to genital characters for checking our species. I have been unable to find any useful differences in either the male or the female genitalia. As a result, we do not know what the limits of our species are. Forbes (1923:582) has found characters of value in separating North American species, and I have seen good differences in European species.

Little is known of the habits and immature stages of the Hawaiian species. The few of our species which have been reared from larvae have been found in mosses or lichens on tree trunks or mossy banks, and one unusual species was found by Dr. Swezey to be a stem-borer in *Lycopodium* (see *Scoparia lycopodiae* Swezey). Perhaps the caterpillars of most of our species will be found to live in silken tunnels in mosses and lichens. Less than 10 percent of our species have been reared. We will never understand this group until extensive rearing of series of examples has been undertaken.

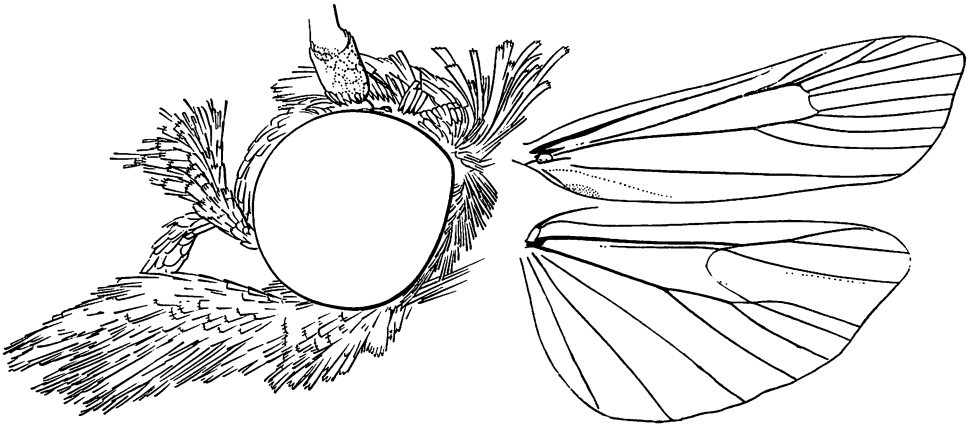


Figure 177—Head of *Scoparia crataea* Meyrick and wing venation of *Scoparia hawaiiensis* Butler.

In *Fauna Hawaiiensis* (1899:247–249), Meyrick gave a key to the 57 species recognized by him. That key is inaccurate, misleading and practically worthless. I have been unable to use it, even with his types in hand. The new key presented here is only a preliminary attempt to break this mass of forms into groups. It has not been tested by use, and only by use can it be perfected. Abraded specimens in this genus can hardly be run through the key, and they may be worse than useless—they may be definitely misleading. It must be kept in mind at all times that we are here dealing with a most difficult complex and that great care must be used in running the key.

KEY TO THE HAWAIIAN SCOPARIA

(Based upon the types)

1. Fore wings with a large, subrhomboidal, black patch occupying about the middle third of wing and based on costa, as in figures of *nectarioides*, *amphicypella*, *rhombias* and *tetranesa* 2
Fore wings with pattern different 4
- 2(1). Fore wing pattern as in figure 192 with extensive yellow scaling in the white areas; Hawaii **nectarioides** Swezey.
Pattern different, without such yellow scaling 2a
- 2a(2). Apex of fore wing without two prominent, subterminal, black spots; distal edge of subrhomboidal black patch slanting basad; Kauai **rhombias** Meyrick.
Apex of fore wing with two prominent, subterminal black patches; distal edge of subrhomboidal patch slanting distad 3
- 3(2a). Subrhomboidal patch solid black; Haleakala, Maui **tetranesa** Meyrick.
Subrhomboidal patch indented by a white costal patch; Kauai **amphicypella** Meyrick.
- 4(1). Fore wing with a black subterminal band or area extending entirely and uninterrupted across wing from costa to posterior margin 5
Fore wing without such a complete band; in some examples it is almost continuous, but it is always broken in some way 12
- 5(4). Crown of head mostly black-scaled; fore wings with white patches rather small and appearing scattered and not in a bold pattern; as in figure 201; Kauai **thalamias** Meyrick.
Crown of head yellowish or white; fore wings with markings more clearly defined 6

- 6(5). Crown of head yellowish 7
 Crown of head white 8
- 7(6). Labial palpi almost entirely black except for pale base;
 head with a black tuft projecting in front of base of
 each antenna; Kauai **tyraula** Meyrick.
 Labial palpi conspicuously white above; head without
 black tufts; Molokai **miantis** Meyrick.
- 8(6). Antemedial black band connected by black scaling to
 medial and postmedial black areas; Oahu
 **pentaspila** Meyrick.
 Antemedial black band separated from medial and post-
 medial black areas by white medial band 9
- 9(8). Basal and antemedial black bands broadly fused; Ha-
 waii **orthoria** Meyrick.
 A white line separating or almost separating basal and
 antemedial black bands 10
- 10(9). Basal black band separated completely from antemedial
 black band by the narrow white line; West Maui . . .
 **antimacha** Meyrick.
 Basal black band connected across the white line by a
 narrow, black connective; Oahu and Kauai 11
- 11(10). Inner margin of combined postmedial and subterminal
 black bands forming a straight line across wing, as in
 figure 190; Oahu **mesoleuca** (Meyrick).
 This line indented by white and irregular, as in figure
 185; Kauai **gonodecta** Meyrick.
- 12(4). Ground color of fore wings nearly uniform dark, slate
 grey and rather shiny in good examples; a black
 costal blotch before middle; as in figure 200; Kauai .
 **siderina** Meyrick.
 Not so; if partly dark grey, then mixed with other colors . . 13
- 13(12). Fore wings with considerable or extensive mixture of
 orange or dark orange scales amongst the black scal-
 ing (do not confuse orange or yellow scaling which is
not in the black pattern) 14
 Fore wings not so 18
- 14(13). Hind wings very dark; Molokai **nyctombra** Meyrick.
 Hind wings pale fuscous or nearly white 15
- 15(14). Base of palpi and "throat" white and strikingly con-
 trasted to dark brown on remainder of palpi; male
 with a large, conspicuous, nearly naked, elongate
 "sex spot" in cell of fore wing; Molokai, Maui
 **oenopis** Meyrick.
 Palpi not bicolored and "throat" not white 16

- 16(15). White areas on fore wing appearing mostly as spots instead of lines; as in figure 189; Hawaii.....
 **marmarias** Meyrick.
 White lines well developed or moderately so.....17
- 17(16). The white antemedial and white subbasal lines enclosing a patch of yellow or orange scales; as in figure 186; Kauai.....**ianthes** Meyrick.
 Without such an enclosed yellow patch; as in figure 178; Oahu.....**aeolias** Meyrick.
 (NOTE: The status of *marmarias*, *ianthes* and *aeolias* as distinct species is questionable.)
- 18(13). Fore wings with a very striking and characteristic pattern of white-lined veins with black scaling between; as in figure 203; Maui, Hawaii.....**venosa** Butler.
 Not so.....19
- 19(18). Head, thorax and fore wings shining coppery and/or purplish; fore wings obscurely marked; Hawaii.....
**erebochalca** Meyrick.
 Not so.....20
- 20(19). Tegulae, except for black shoulder scales, white, an occasional example with dark tips, but not mixed elsewhere; all species with a striking black and white pattern.....21
 Tegulae always much mixed with dark scales or almost entirely dark; some species black and white, but most otherwise.....28
- 21(20). White areas on fore wings abundantly suffused with black scales; Haleakala, Maui.....**passalota** Meyrick.
 White areas on fore wings with at most few black scales..22
- 22(21). Antemedial line in fore wing broken and not continuous across wing, as in figure 188; Hawaii.....
**loxocentra** Meyrick.
 Antemedial line continuous across wing, although irregular.....23
- 23(22). Antemedial line in fore wing joined or nearly joined to the black medial band by an extension or connective.....24
 Antemedial band well separated at all points from medial band.....26
- 24(23). Black connective between antemedial and medial black bands without an extension or rounded expansion toward posterior margin of wing, but as in figure 200; Kauai.....**struthias** Meyrick.

- With a conspicuous expansion from the black connective between antemedial and medial bands which extends definitely behind the connective, as in figures of *formosa* and *cryerodes* 25
- 25 (24). Antemedial band with the posterior end distinctly bent basad at the hind margin of the wing as an apparent angulation or rather rounded extension basad; as in figure 181; Kauai **cryerodes** Meyrick.
- Antemedial band with its inner edge moderately even and not bent or extended basad at posterior margin of wing; as in figure 184; Maui **formosa** (Butler).
- 26 (23). The black terminal spot enclosing a white diagonal spot which does not divide the black mark completely; as in figure 202; Kauai **triacma** Meyrick.
- The black terminal spot completely separated to form a large black spot at the end of costal margin and a smaller black spot at about middle of termen; as in figures of *balanopis* and *oxythema* 27
- 27 (26). Antemedial band with its chord appearing strongly oblique across wing as in figure 179; Hawaii **balanopis** Meyrick.
- Antemedial band more nearly vertical, as in figure 195; Kauai **oxythema** Meyrick.
- (NOTE: Are the above seven "species" more than subspecies?)
- 28 (20). Antemedial line very strongly and conspicuously angulated as in figures of *frigida* (fig. 184) and *epimystis* (fig. 183) 29
- Antemedial line never so formed 30
- 29 (28). Under side of hind wing with postmedial dark band obsolete; Maui and Lanai **frigida** Butler.
- Under side of hind wing with postmedial dark band developed; Hawaii **epimystis** Meyrick.
- 30 (28). Antemedial line appearing double, as in figures of *zophochlora* (fig. 203) and *melichlora* (fig. 189); pale areas on fore wings pale yellow-scaled 31
- Antemedial line not so formed; fore wings with or without some yellow scaling 32
- 31 (30). Scaling of "throat" dark brown; fore wing pattern as figured; hind wings uniformly comparatively dark; Molokai **zophochlora** Meyrick.
- Scaling on "throat" pale; fore wings with conspicuous yellow scaling, pattern as figured; hind wings paler, outer areas darker than disc; Hawaii **melichlora** Meyrick.

- 32 (30). First segment of labial palpi almost entirely dark and colored as second segment 33
 First palpal segment pale, usually white, and strongly contrasting in color with second segment 34
- 33 (32). Fore wings yellowish-tinged, the white scaling obviously with a yellowish cast; pattern as in figure 186; Hawaii **hawaiiensis** Butler.
 Fore wings not yellowish, the white scaling pure white and not tinged with yellow; pattern as in figure 178; Hawaii **actias** Meyrick.
- 34 (32). A very small species not over 13 mm. in expanse; fore wings extensively pale and hind wings appearing darker than fore wings under magnification; as in figure 185; Kauai, Oahu **geraea** Meyrick.
 Not so, usually distinctly more than 13 mm. in expanse, but if about 13 mm. or less, then color pattern very different 35
- 35 (34). Fore wings with a striking black and white pattern, as in figures of *jucunda* and *melanocephala* 36
 Fore wing pattern, even if black and white, distinct from *jucunda* and *melanocephala* 37
- 36 (35). Head almost or entirely white-scaled; outer extension of antemedial dark band well separated from post-medial dark areas; Lanai and Hawaii . . . **jucunda** Butler.
 Head extensively black with some white marks; outer extension of antemedial dark band connected to post-medial dark costal mark; Hawaii
 **melanocephala** Meyrick.
- 37 (35). A comparatively pale species with fore wings nearly uniformly rather golden-brown and with poorly developed markings as in figure 187; Molokai
 **isophaea** Meyrick.
 Not so 38
- 38 (37). Frons nearly or entirely very dark, nearly black 39
 Frons either brown, yellowish, whitish or mixed, but never nearly uniformly very dark 41
- 39 (38). Antemedial line with a well-marked white zone bounding its border basad, as in figure 181; Hawaii
 **crataea** Meyrick.
 Without such a white band 40
- 40 (39). Posterior half of preapical area of fore wing with a paler zone in which the veins and intervein areas are marked with black and yellow; either color may be in streak form, as figured; Maui **clonodes** Meyrick.

- A very dark, poorly marked species which lacks the pale sub-apical zone as described for *clonodes*; as figured; Kauai, Oahu, Lanai. **thyellopis** Meyrick.
- 41 (38). A small, rather distinctive species about 13–15 mm. in expanse, with very dark hind wings and fore wing markings not bold, the pale scaling yellowish; as figured; Hawaii. **parachlora** Meyrick.
Not so. 42
- 42 (41). Labial palpi extending beyond fore edges of eyes for a distance more than twice the length of an eye; usually a large (up to 25 mm.) species of characteristic facies, as figured; Kauai. **probolaea** Meyrick.
Palpi extending in front of eyes for a distance not more than twice the length of an eye, usually much shorter. . 43
- 43 (42). Fore wings with a definite black and white pattern as in figures of *halirrhoa*, *ombrodes* and *pachysema*. 44
Not so, even if wings approach a black and white pattern there is much grey or brown or other colored scaling involved. 47
- 44 (43). Antemedial white band very nearly straightly oblique on its distal border from costa to posterior margin of wing; pattern as figured; Maui ?
. **pachysema** (Meyrick).
Antemedial white band always angulated. 45
- 45 (44). Fore wing with two small black dots placed obliquely in middle of wing as in figure; Hawaii.
. **halirrhoa** Meyrick.
Not so; if two spots are evident, they are placed one above the other. 46
- 46 (45). Fore wings with white scaling more extensive as in figure 194; Oahu. **ombrodes ombrodes** (Meyrick).
Fore wings with dark scaling more extensive, as in figure 194; Oahu, Molokai, Lanai, Hawaii.
. **ombrodes perkinsi** Zimmerman.
- 47 (43). Lines and spots in fore wings obscure, the ground color brown and suffused extensively with white scales in a characteristic way as in figure 188; hind wings comparatively dark; an unusual form which mines *Lycopodium* on Oahu. **lycopodiae** Swezey.
Not so. 48
- 48 (47). Fore wings with a dark macula just basad of the tornal angle as in figure; a very small species 11–13 mm. in expanse; Oahu, Hawaii (?) **religiosa** Meyrick.
Not so. 49

- 49 (48). Fore wings with a wide, pale, yellowish-scaled, antemedial band, and wing pattern as in figure; Maui, Lanai. **empeda** Meyrick.
Not so. 50
- 50 (49). As in figure (the unique type is not in perfect condition; it is an obscure, indefinitely marked form, and its status is uncertain); Hawaii. **peronetis** Meyrick.
Not so. 51
- 51 (50). Fore wings with a pale, longitudinal zone beyond middle as in figure 199; Kauai. **platyscia** Meyrick.
Without such a pale zone in fore wing. 52
- 52 (51). Distal edge of antemedial fascia without distinct dark edging or nearly black markings, as in figure 187; Maui. **ischnias** (Meyrick).
Distal edge of antemedial line either with conspicuous dark edging or dark marks, pattern different. 53
- 53 (52). As in figure, fore wings with very dark markings confined mostly to outer edge of antemedial line (the most prominent marks on wing), and a less well-developed dark costal area (which may be compound) just beyond middle and a paler subapical dark area beginning near middle of termen and extending back toward tornus, but without well-marked dark patches elsewhere, except beyond middle along costa; Oahu. **montana** (Butler).
Not so; with more extensive dark marks. 54
- 54 (53). Distinctly greyish species (without magnification), with fore wing patterns as in figure 190 of *meristis* and *meristis halmaea*. 55
Fore wing patterns different. 56
- 55 (54). Kauai examples; orbicular dark spot (appearing as an outward extension of antemedial line) developed as a distinct blackish macula as in figure 190.
. **meristis halmaea** (Meyrick).
Hawaii examples; orbicular dark spot obsolescent or absent, as in figure 190. **meristis meristis** Meyrick.
- 56 (54). Orbicular and reniform spots white-centered and outlined in black as in figure 182; Molokai.
. **dactyliopa** Meyrick.
Not so. 57
- 57 (56). Area between antemedial line and basal dark markings on fore wings quite pale as compared to area distad of the line; as in figure 182; Kauai. . . **demodes** (Meyrick).
With less contrast in color between the basal and distal sides of the antemedial line and not as in *demodes*. 58

- 58 (57). Fore wings with yellowish scales subdued and the wing appearing more grey and fuscous, as in figure 180; Haleakala, Maui... **bucolica macrophanes** (Meyrick). Yellow scales on fore wings intensified and giving a conspicuous yellow tinge to fore wings.....59
- 59 (58). Hawaii form with white scaling on fore wings more extensive; as in figure 180..... **bucolica pyrseutis** (Meyrick). Oahu and Molokai form with white areas on fore wings reduced; as in figure 180... **bucolica bucolica** Meyrick.

Scoparia actias Meyrick (fig. 178).

Scoparia actias Meyrick, 1899:256, pl. 7, fig. 10.

Endemic. Hawaii (type locality: Oloa, 2,000 feet).

Hostplant: Unknown.

Scoparia aeolias Meyrick (fig. 178).

Scoparia aeolias Meyrick, 1899:262.

Endemic. Oahu (type locality: 2,000 feet).

Hostplant: Unknown.

Scoparia amphyrypella Meyrick (figs. 178, 204).

Scoparia amphyrypella Meyrick, 1899:250, pl. 7, fig. 4.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Scoparia antimacha Meyrick (fig. 179).

Scoparia antimacha Meyrick, 1899:252.

Endemic. Maui (type locality: Lahaina, 2,000 feet).

Hostplant: Unknown.

Meyrick said, "Head and thorax white mixed with black." It would be more correct to say, "Head white; thorax white mixed with black."

Scoparia balanopsis Meyrick (figs. 179, 204, 209).

Scoparia balanopsis Meyrick, 1899:250, pl. 7, fig. 5; 1904:133.

Endemic. Oahu, Molokai, Hawaii (type locality: Kona, 4,000 feet).

Hostplant: Unknown.

Scoparia bucolica bucolica Meyrick (fig. 180).

Scoparia bucolica Meyrick, 1899:263.

Endemic. Oahu, Molokai (type locality: 4,000 feet).

Hostplant: Moss.

Scoparia bucolica macrophanes (Meyrick), **new status** (fig. 180).

Scoparia macrophanes Meyrick, 1888:231; 1899:271.

Endemic. Maui (type locality: probably Haleakala).

Hostplant: Unknown.

I consider this to be a grey Maui race of *bucolica* and not entitled to full specific rank. I do not agree with Hampson (1897:233) who listed it as a synonym of *montana*.

Meyrick (1888) did not designate as type the Butler example (collected by Blackburn) he used to describe *macrophanes*, and no Blackburn specimen is in either Meyrick's collection or the British Museum collection. The type, therefore, appears to be lost. In *Fauna Hawaiiensis*, Meyrick described *macrophanes* from two Perkins' specimens. One of these is in the British Museum drawer, and the other is in Meyrick's collection. I have designated the specimen in the British Museum collection as neotype; the example in the Meyrick collection is faded.

Meyrick, in *Fauna Hawaiiensis*, said that the specimens he had had an expanse of 17 to 20 mm. My measurements indicate that his example, which does not have the wings fully expanded, measures 18 mm.; the neotype is 21 mm. in expanse.

Scoparia bucolica pyrseutis (Meyrick), **new status** (fig. 180).

Scoparia pyrseutis Meyrick, 1899:263; 1904:364.

Endemic. Hawaii (type locality: Kona, 6,000 feet).

Hostplant: Unknown.

I consider this form to be a Hawaii race of *bucolica*. The records for Oahu for this form should be deleted. I have not studied specimens under this name from Oahu, but they are possibly misidentified.

Scoparia clonodes Meyrick (fig. 181).

Scoparia clonodes Meyrick, 1899:265, pl. 7, fig. 20.

Endemic. Maui (type locality: Haleakala, 5,000 feet).

Hostplant: Unknown.

Scoparia crataea Meyrick (figs. 177, 181).

Scoparia crataea Meyrick, 1899:259.

Endemic. Hawaii (type locality: Hilo, 2,000 feet).

Hostplant: Unknown.

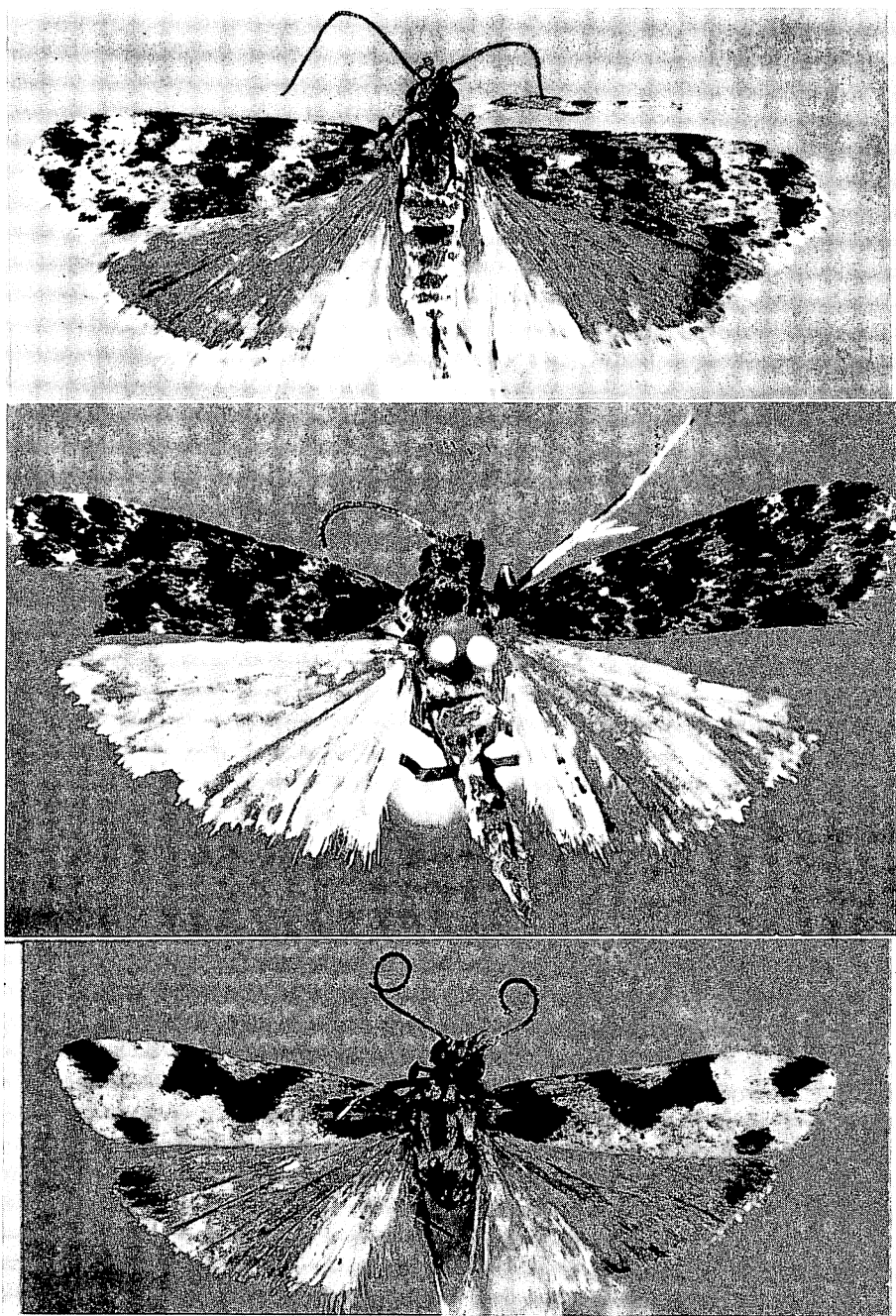


Figure 178—*Scoparia*. Above: Type of *actias* Meyrick; Olaa, Hawaii; expanse, 19 mm. Center: Type of *aeolias* Meyrick; Oahu, 2,000 feet; expanse, 16 mm. Below: Type of *amphicybella* Meyrick; Waimea Mts., Kauai, 4,000 feet; expanse, 17.5 mm.

Scoparia cryerodes Meyrick (fig. 181).

Scoparia cryerodes Meyrick, 1899:259, pl. 7, fig. 13.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Scoparia dactyliopa Meyrick (fig. 182).

Scoparia dactyliopa Meyrick, 1899:268, pl. 7, fig. 22.

Endemic. Oahu, Molokai (type locality: over 4,500 feet).

Hostplant: Moss.

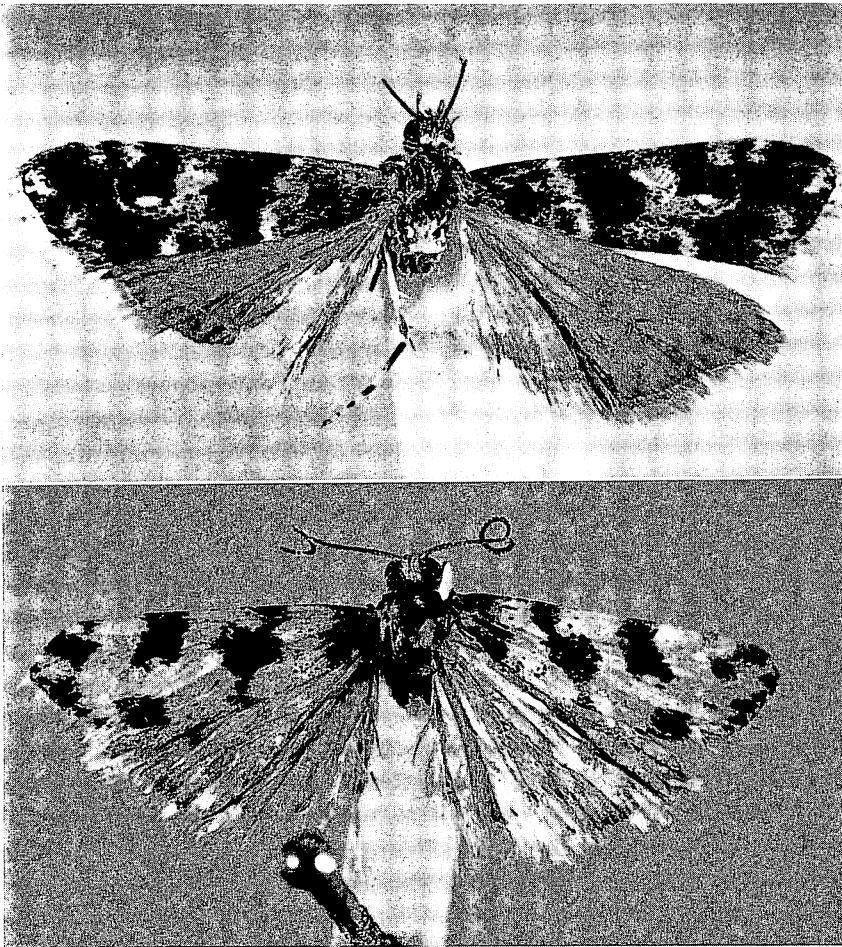


Figure 179—*Scoparia*. Above: Type of *antimacha* Meyrick; Lahaina, Maui, 2,000 feet; expanse, 18 mm. Below: Type of *balanopis* Meyrick; Kona, Hawaii, 4,000 feet; expanse, 16.5 mm. as mounted, but the wings are tilted upward.

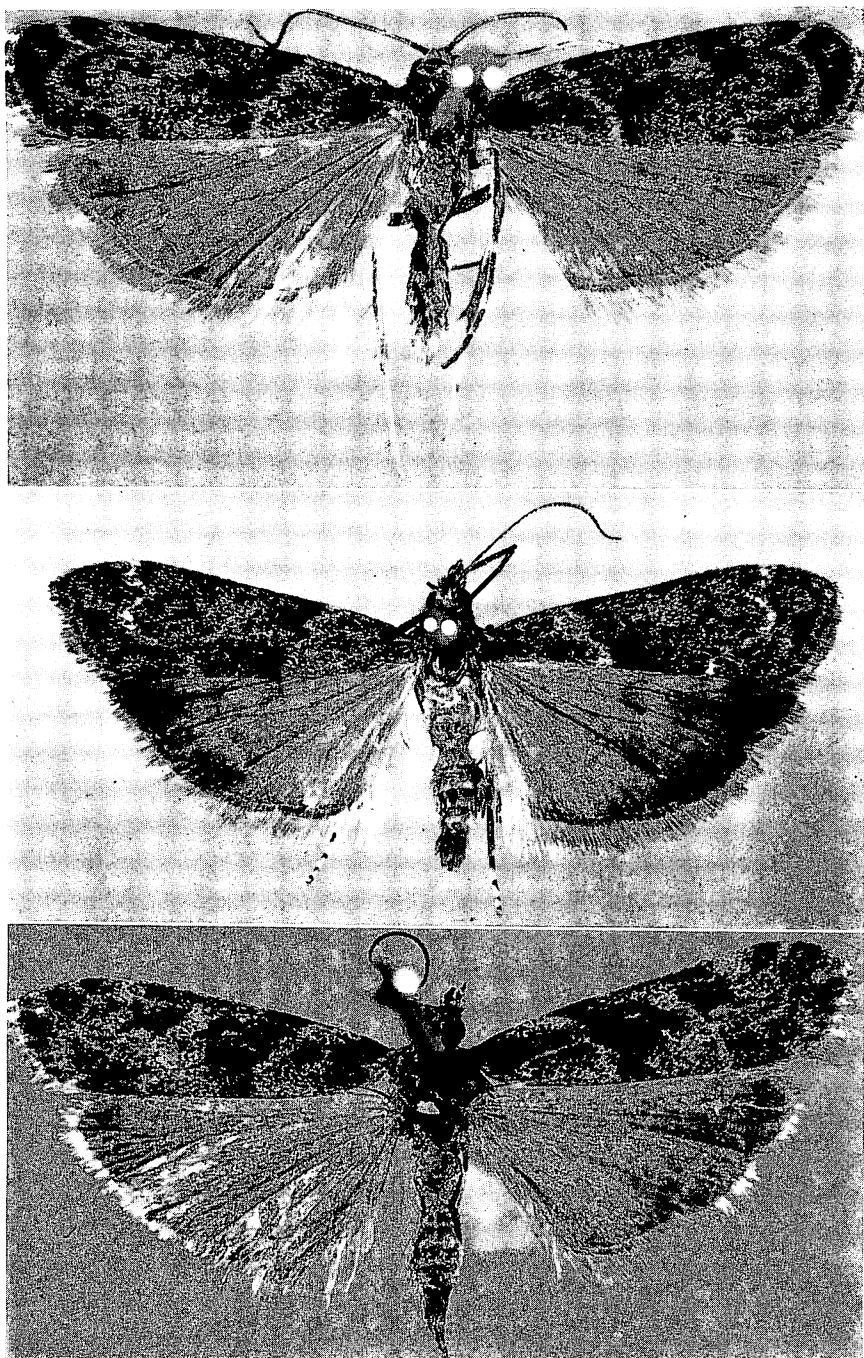


Figure 180—*Scoparia*. Above: Type of *bucolica* Meyrick; Molokai, 4,500 feet; expanse, 20 mm. Center: Neotype of *bucolica macrophanes* (Meyrick); Haleakala, Maui, 5,000 feet; expanse, 21 mm. Below: The type of *bucolica pyrseutis* (Meyrick); Kona, 6,000 feet; expanse, 19 mm.

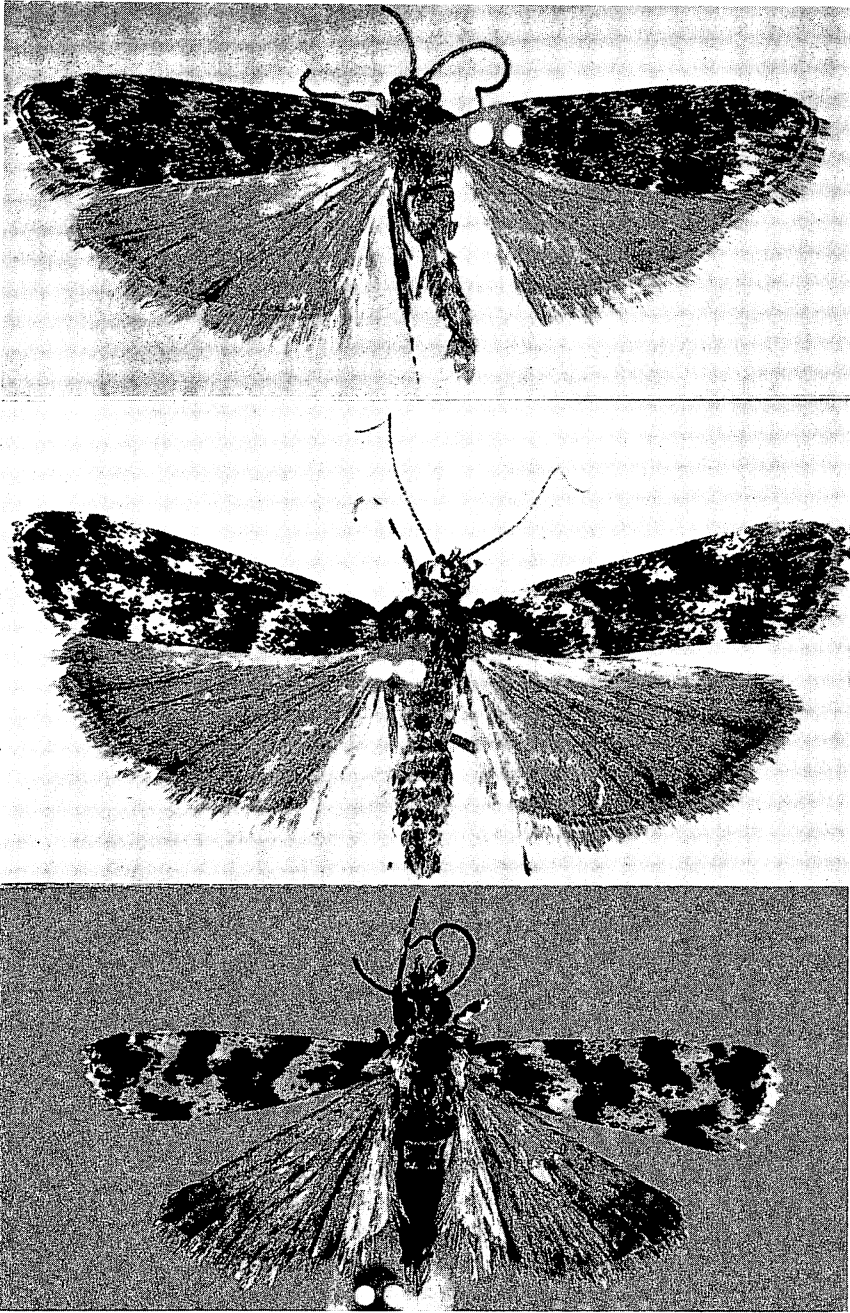


Figure 181—*Scoparia*. Above: The type of *clonodes* Meyrick; Haleakala, Maui, 5,000 feet; expanse, 18 mm. Center: The type of *crataea* Meyrick; Hilo, Hawaii, 2,000 feet. Below: *cryerodes* Meyrick; Waimea Mts., Kauai, 4,000 feet; expanse, 16 mm.

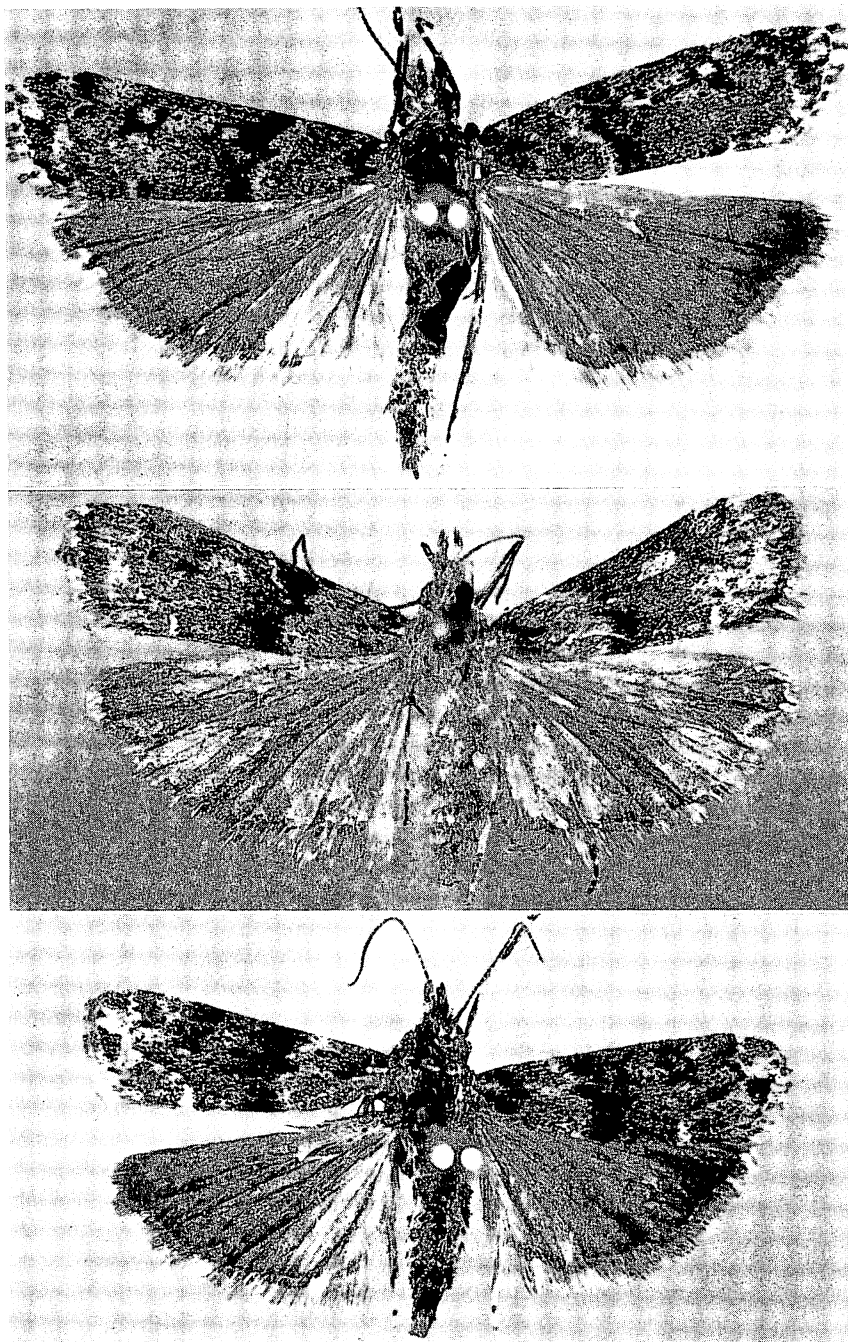


Figure 182—*Scoparia*. Above: *dactyliopa* Meyrick, type; Molokai Mts., above 4,000 feet; expanse, 19 mm. Center: *demodes* (Meyrick), lectotype; "Hawaiian Is. T.B./81" (Blackburn); expanse, 17 mm. Below: Another example of *demodes* in better condition; Waimea Mts., Kauai, 4,000 feet; expanse, 17 mm.

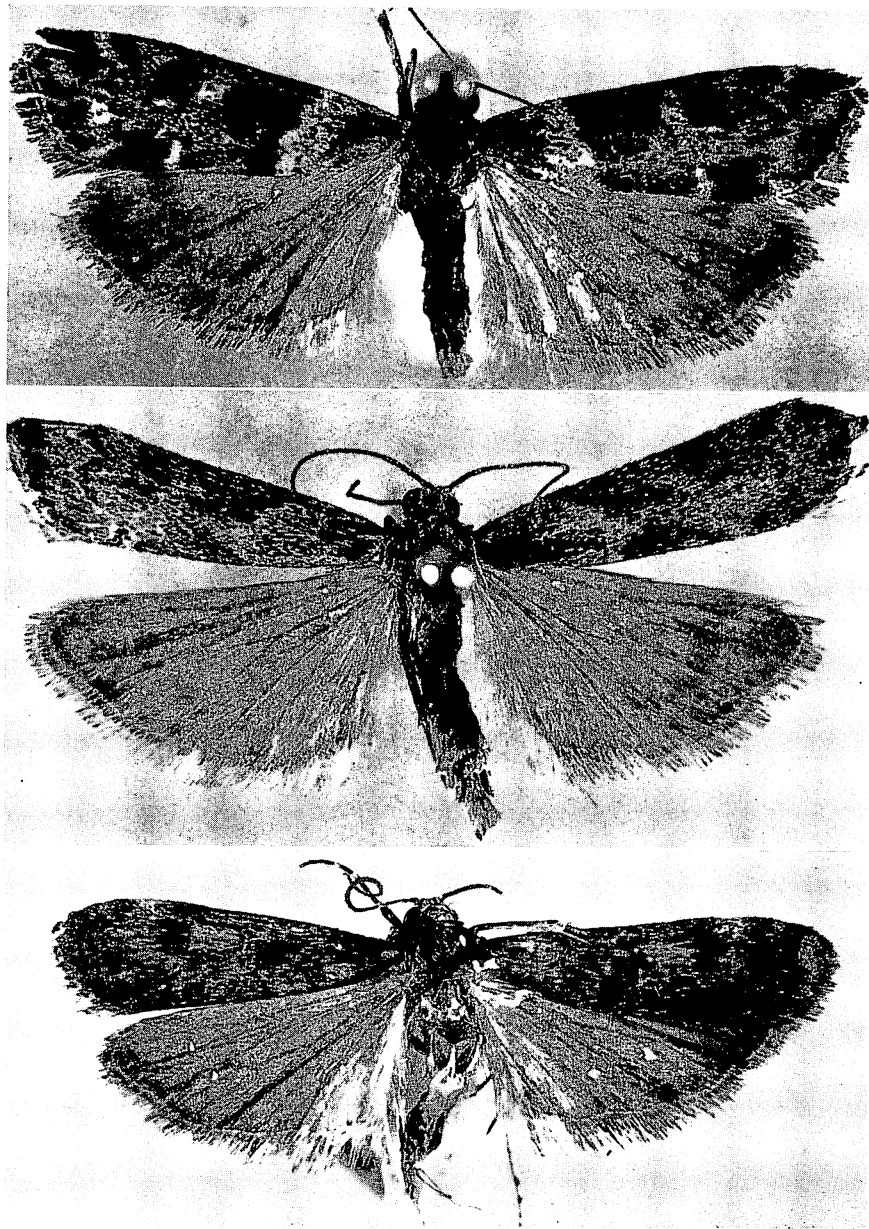


Figure 183—*Scoparia*. Above: *empeda* Meyrick, type; Haleakala, Maui; expanse, 19 mm. (Since the photograph was taken, the type has been damaged.) Center: The type of *epimystis* Meyrick; Kona, Hawaii, 4,000 feet; expanse, 18.5 mm. Below: *erebochalca* Meyrick, type; Kilauea, Hawaii; expanse, 15.5 mm. (The abdomen has been glued on upside down.)

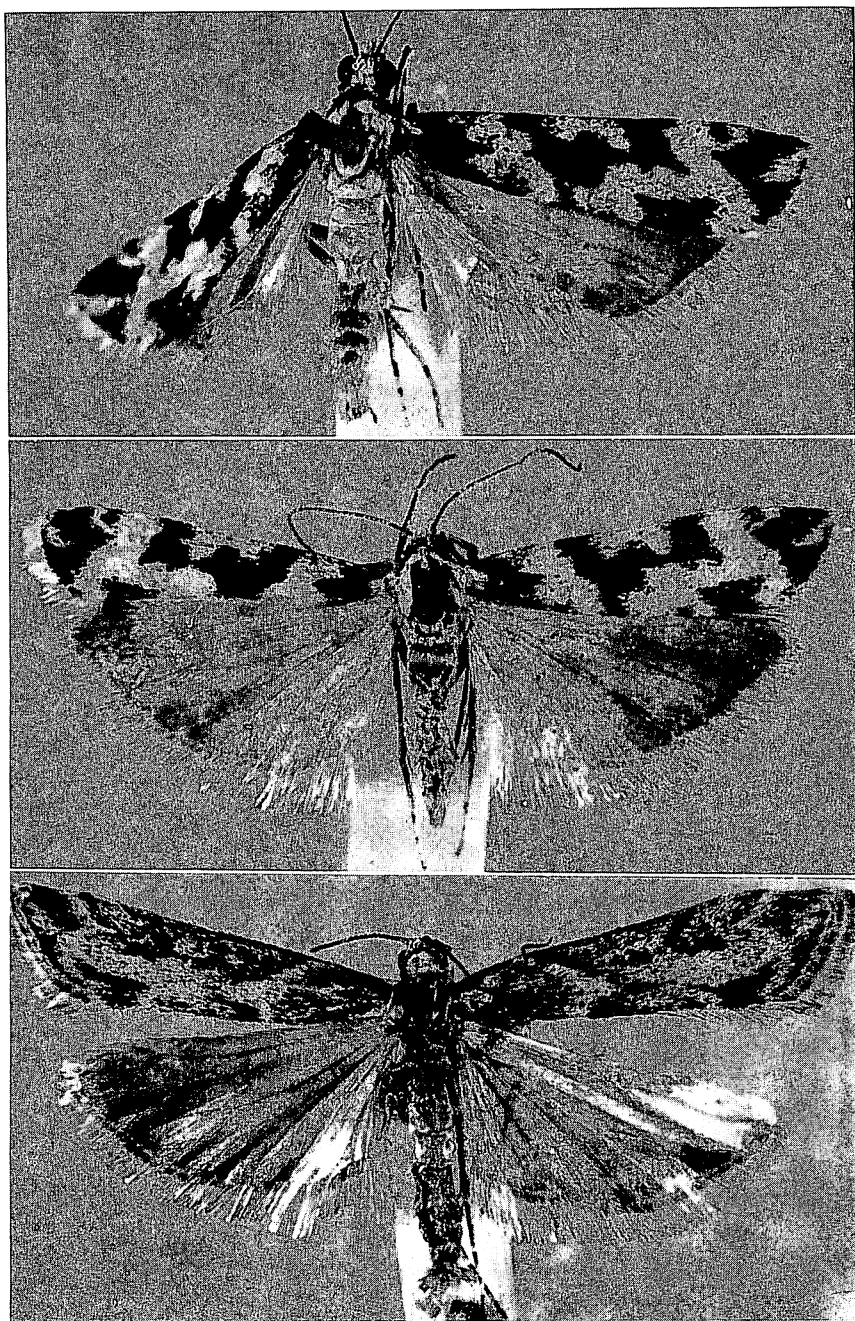


Figure 184—*Scoparia*. Above: *formosa* (Butler), type; "Hawaiian Islands 81.7 130" (Blackburn); length of right wing, 9 mm. Center: Another example of the same species; Haleakala, Maui, 5,000 feet; expanse, 17 mm. Below: *frigida* Butler, type; "Hawaiian Islands 81.7 67" (Blackburn); expanse, 19 mm.

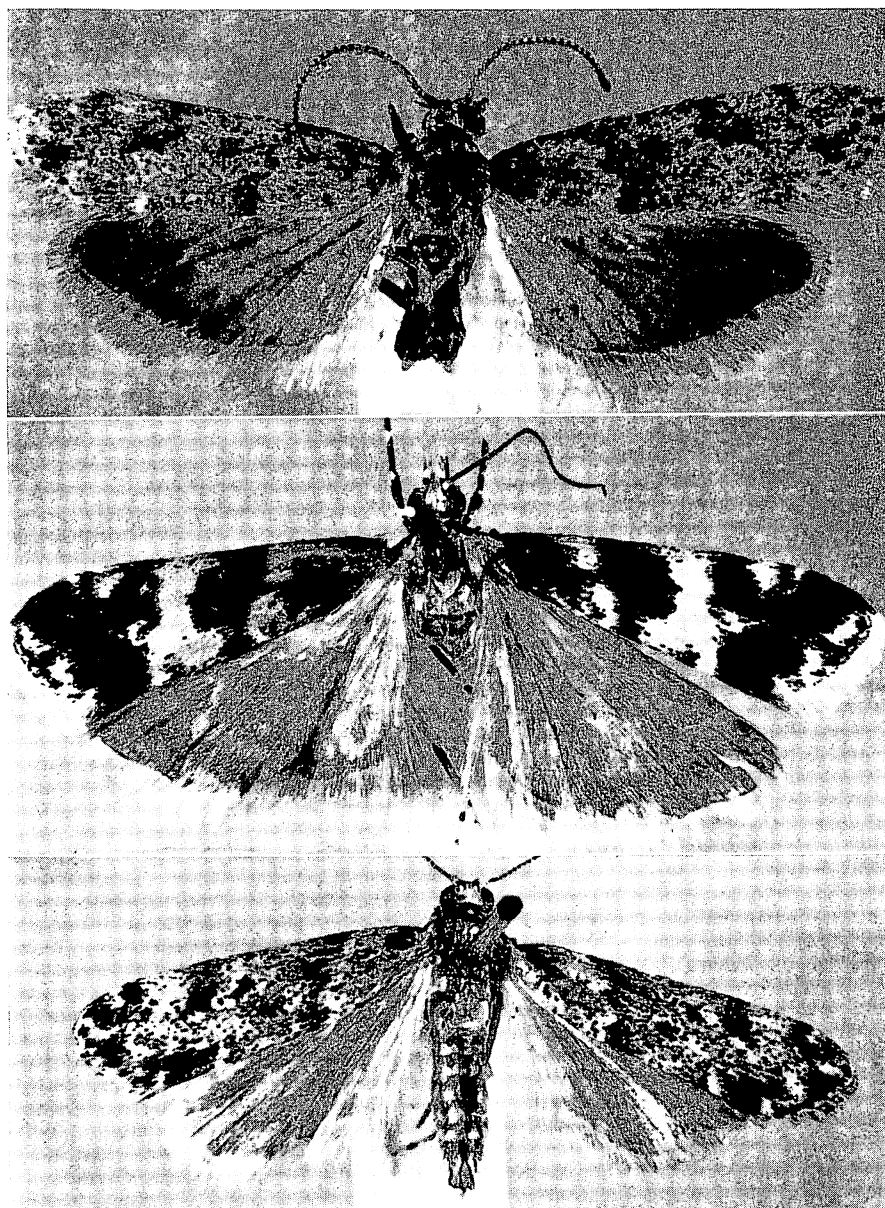


Figure 185—*Scoparia*. Above: *geraea* Meyrick, type; Waianae Mts., Oahu; expanse, 12 mm. Center: *gonadecta* Meyrick; Waimea Mts., Kauai, 4,000 feet; expanse, 18 mm. Below: *halirrhoa* Meyrick; Hilo, Hawaii, 2,000 feet; expanse, 15.5 mm.

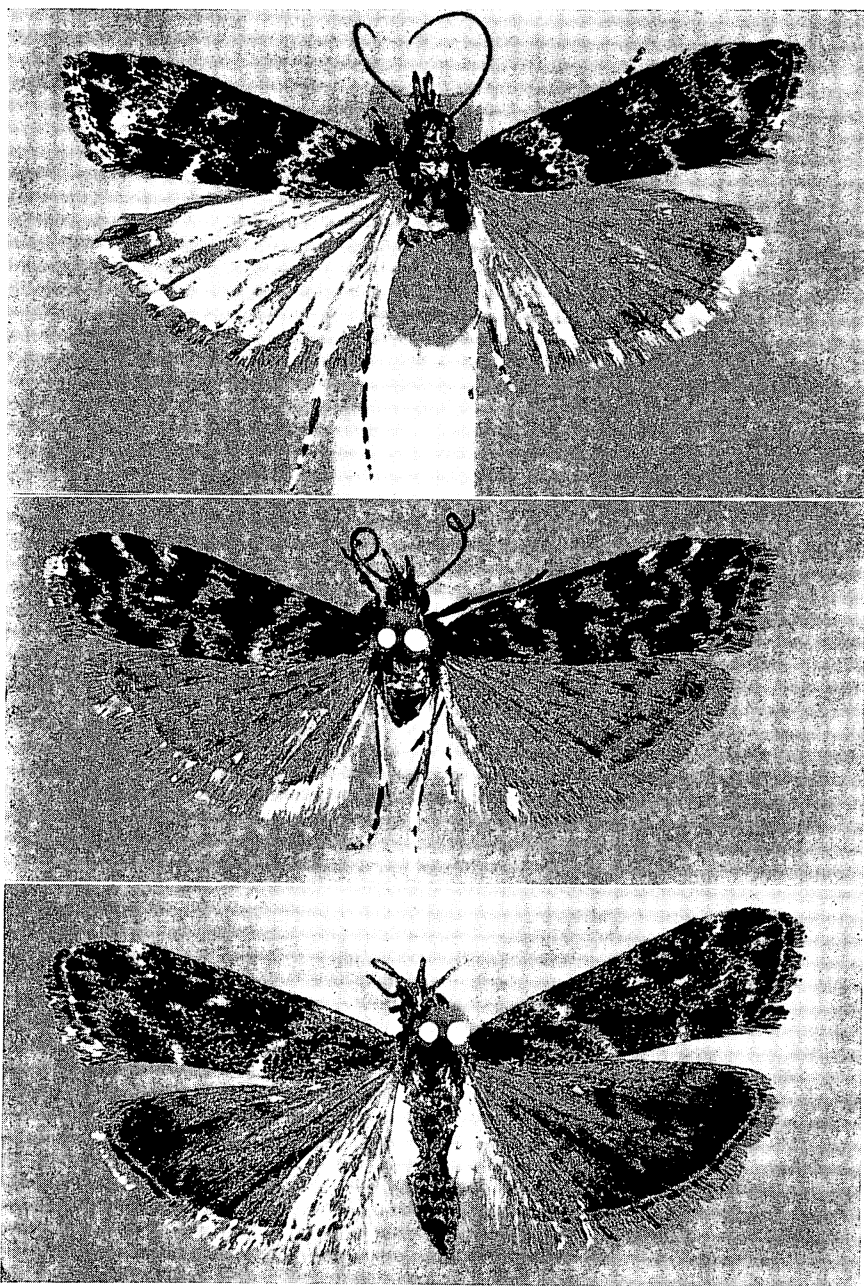


Figure 186—*Scoparia*. Above: *hawaiiensis* Butler, type; "Hawaiian Islands 81-7 83" (Blackburn); expanse, 16.5 mm. Center: *ianthes* Meyrick, type; Waimea Mts., Kauai, 4,000 feet; expanse, 17 mm. Below: The type of the synonym *nectarias* (Meyrick); Lanai, 2,000 feet; expanse, 17.5 mm.

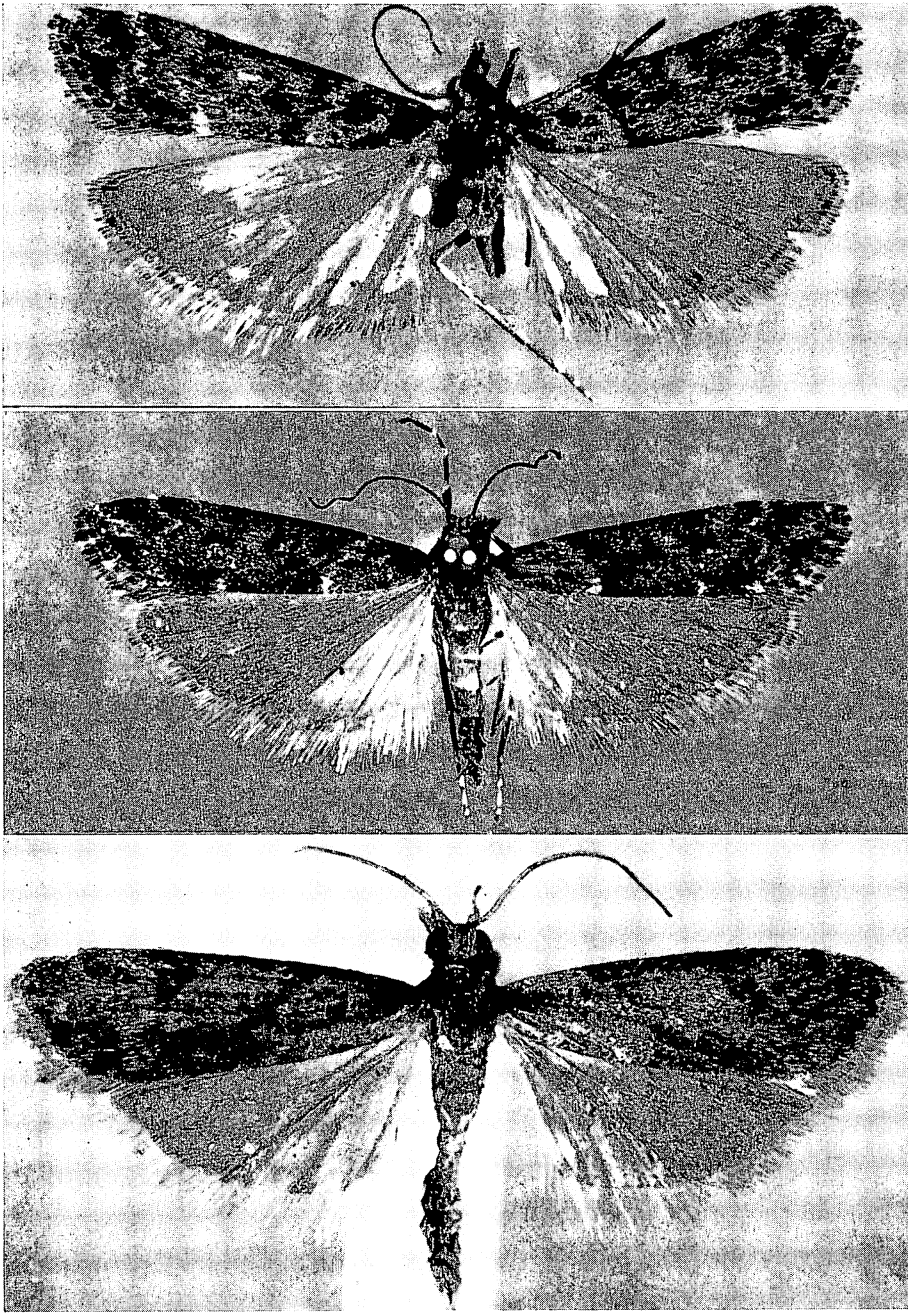


Figure 187—*Scoparia*. Above: *ischnias* (Meyrick), lectotype; "Hawaiian Is. T.B./81" (Blackburn); expanse, 18 mm. Center: The same, a better preserved example; Haleakala, Maui, 9,000 feet; expanse, 20.5 mm. Below: *isophaea* Meyrick, type; Molokai, 3,000 feet; expanse, 16 mm.; (this is a rather poor photograph of the species).

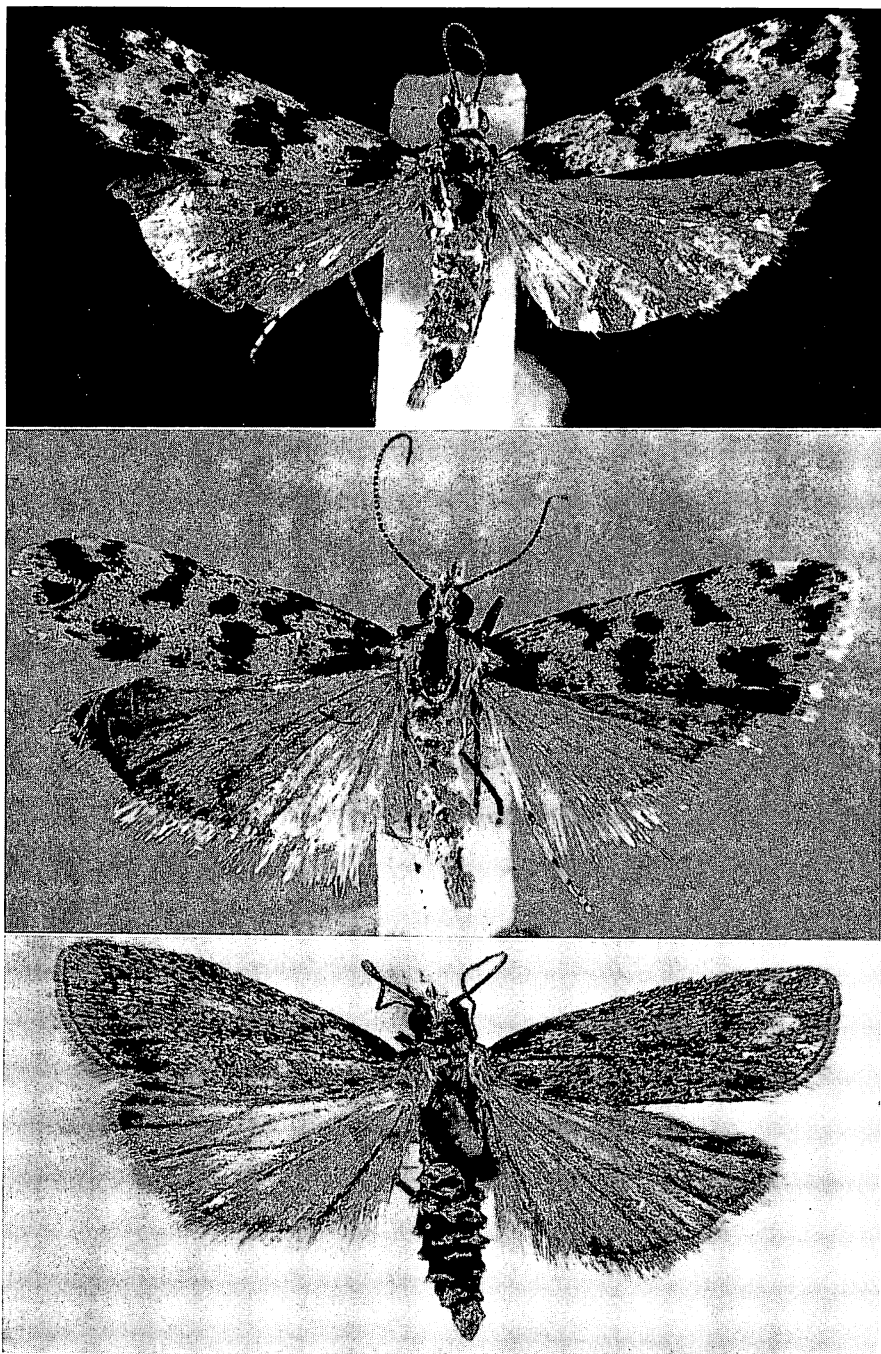


Figure 188—*Scoparia*. Above: *jucunda* Butler, type; "Hawaiian Islands 81-7 82" (Blackburn); expanse, 16.5 mm. Center: *loxocentra* Meyrick, type; Kilauea, Hawaii; expanse, 17 mm. Below: *lycopodiae* Swezey; Wahiawa, Oahu; right fore wing 8 mm. long.

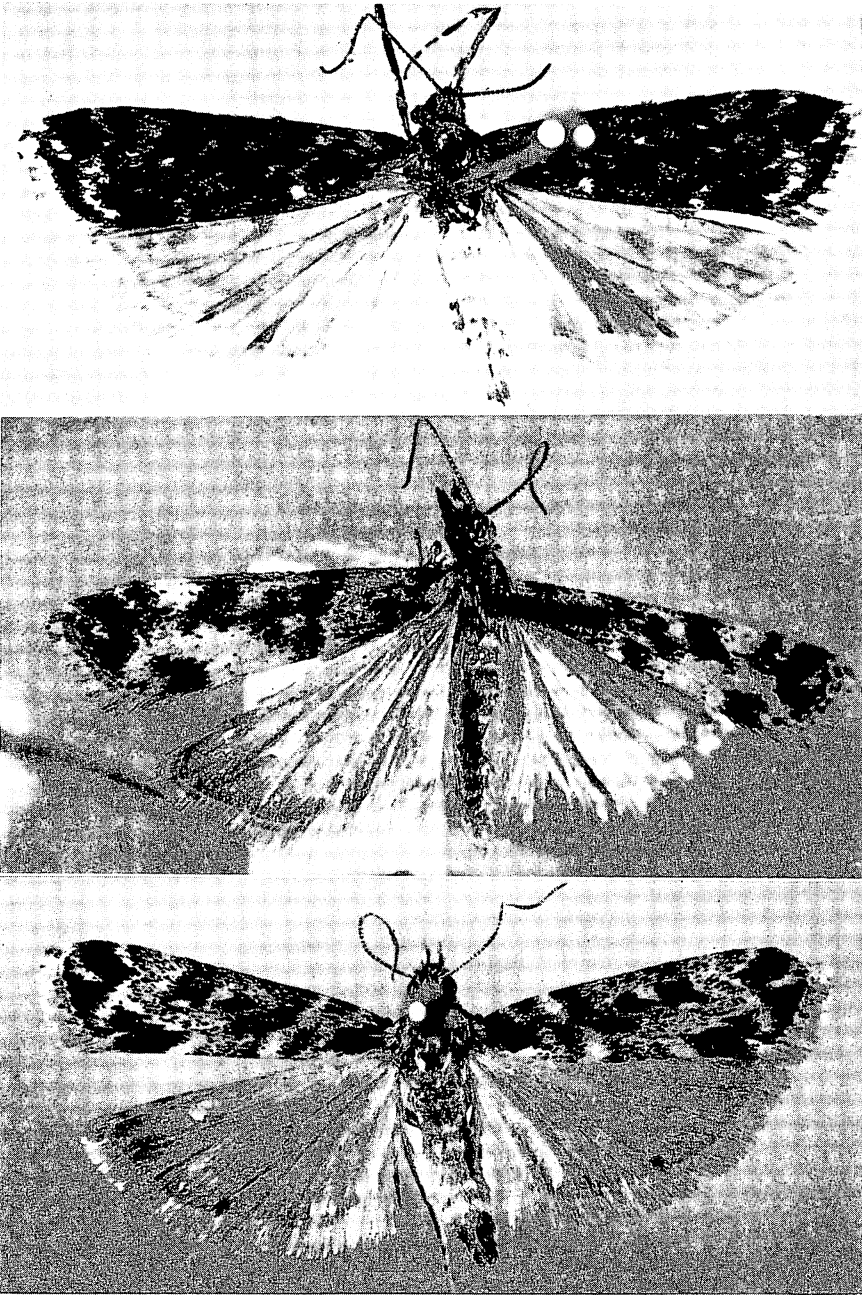


Figure 189—*Scoparia*. Above: *marmarias* Meyrick, type; Hilo, Hawaii, 2,000 feet; expanse, 20 mm.; (this photograph is too dark). Center: *melanocephala* Meyrick, type; Kona, Hawaii, 4,000 feet; left wing length, 8 mm.; (a poorly mounted example). Below: *melichlora* Meyrick, type; Hilo, Hawaii, 2,000 feet; expanse, 19 mm.

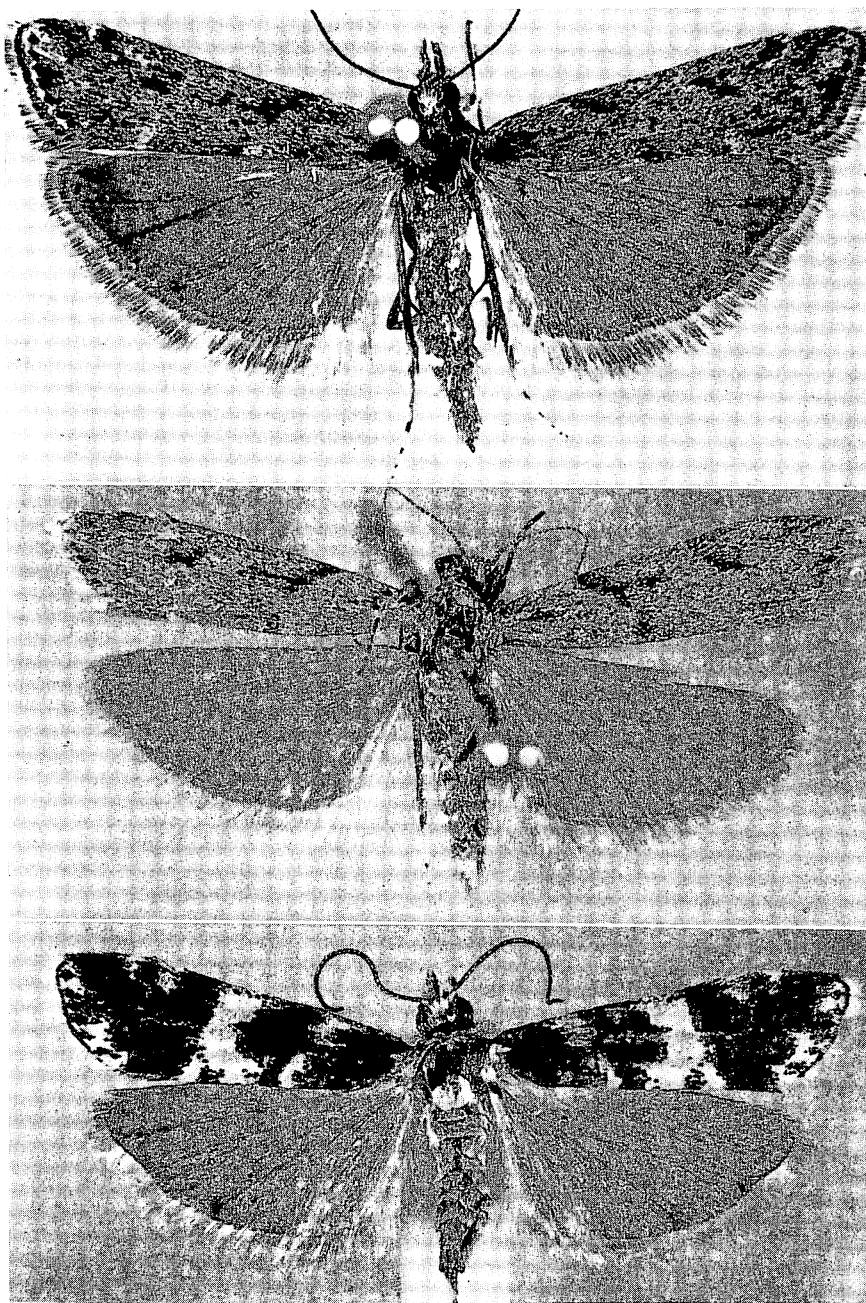


Figure 190—*Scoparia*. Above: *meristis meristis* Meyrick, type; Kona, Hawaii, 4,000 feet; expanse, 18 mm. Center: *meristis halmaea* (Meyrick); Waimea Mts., Kauai, 4,000 feet; expanse, 17.5 mm. Below: *mesoleuca* (Meyrick); Honolulu, 1,300 feet; compared with the lectotype.

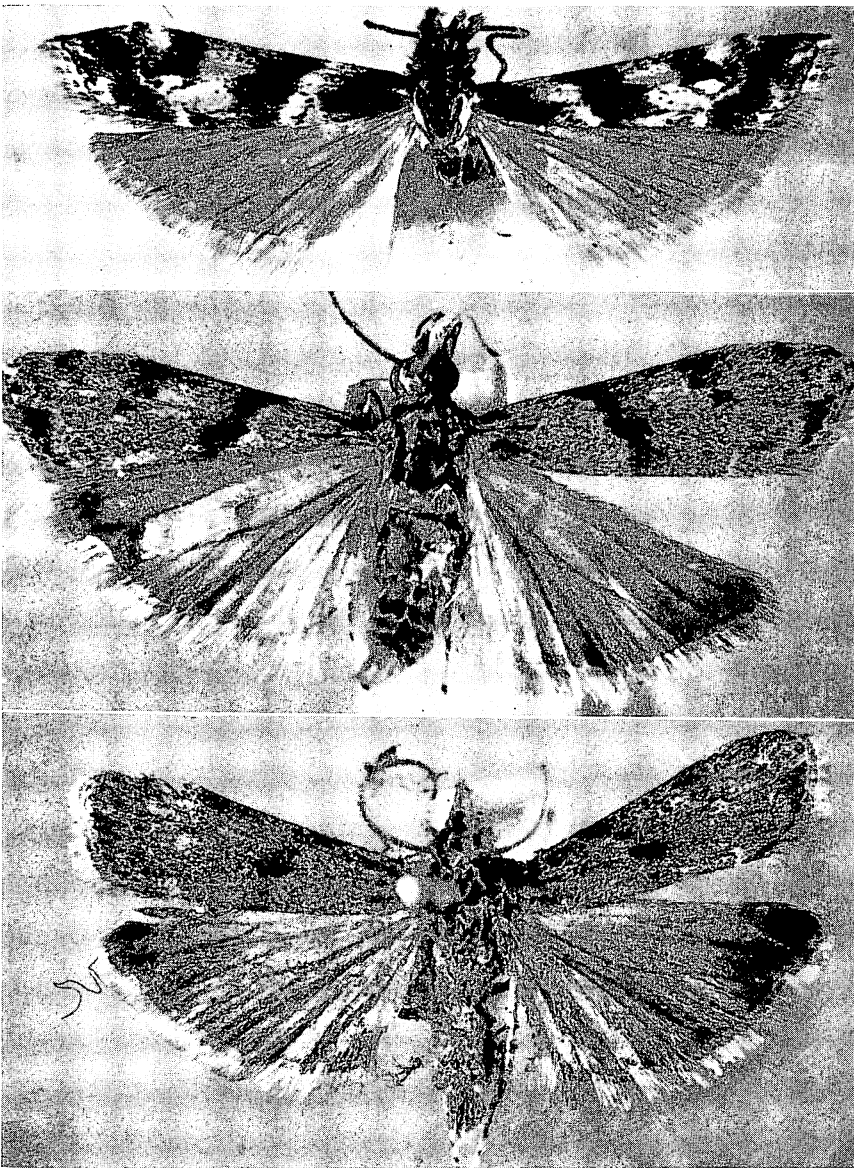


Figure 191—*Scoparia*. Above: *miantis* Meyrick, type; Molokai Mts., 3,500 feet; expanse, 14 mm. Center: *montana* (Butler), type; "Hawaiian Isls. 82-9 (160)" (Blackburn); expanse, 15 mm. Below: The lectotype of the synonym of *montana*, *Xeroscopa melanopis* Meyrick; "Hawaiian Is. T.B./81" (Blackburn); expanse, 15.5 mm.

Scoparia demodes (Meyrick) (fig. 182).

Xeroscopa demodes Meyrick, 1888:234.

Scoparia demodes (Meyrick) Meyrick, 1899:268.

Endemic. Kauai (type locality: not known).

Hostplant: Unknown.

Meyrick did not label his type. I have designated the unique female collected by Blackburn, and in the Meyrick collection, as lectotype. It bears the following label: "Hawaiian Is. T.B./81." I do not know exactly where it was collected.

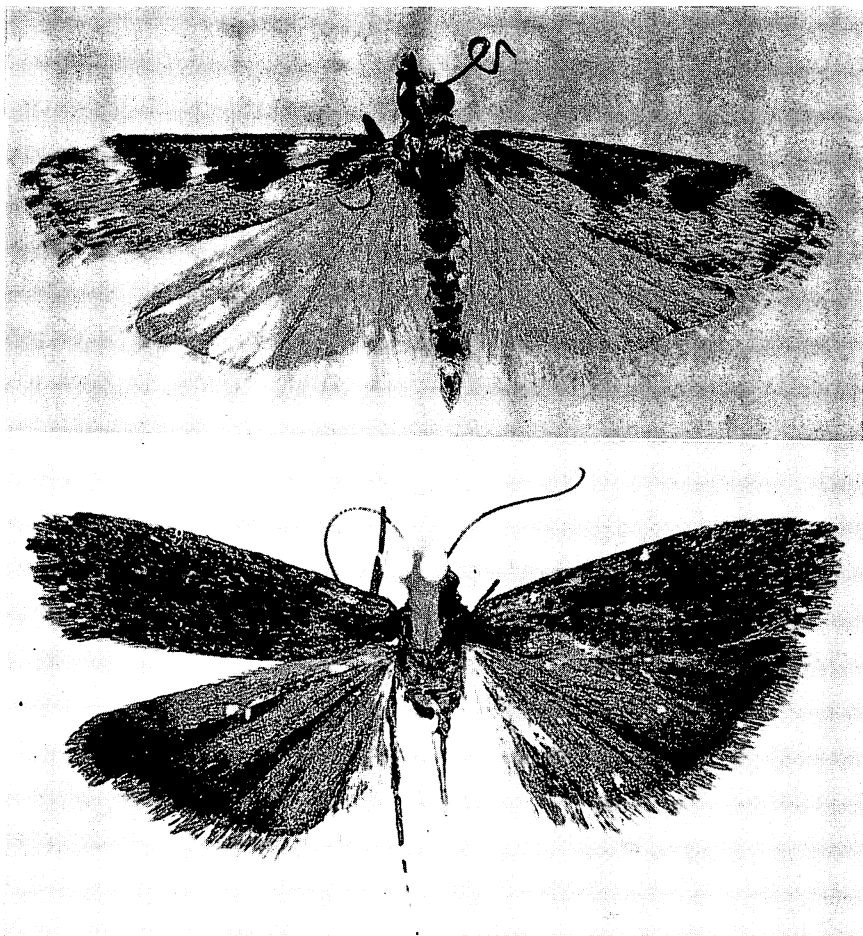


Figure 192—Above: *nectariodes* Swezey, type; Kilauea, Hawaii; length of left fore wing, 7.5 mm. Below: *nyctombra* Meyrick, type; Molokai Mts., 4,500 feet; expanse, 18 mm.

Scoparia empeda Meyrick (fig. 183).

Scoparia empeda Meyrick, 1899:267.

Endemic. Maui (type locality: Haleakala), Lanai.

Hostplant: Unknown.

Scoparia epimystis Meyrick (fig. 183).

Scoparia epimystis Meyrick, 1899:269.

Endemic. Hawaii (type locality: Kona, 4,000 feet).

Hostplant: Unknown.

I believe that this may be only a form of *frigida*; further study is needed.

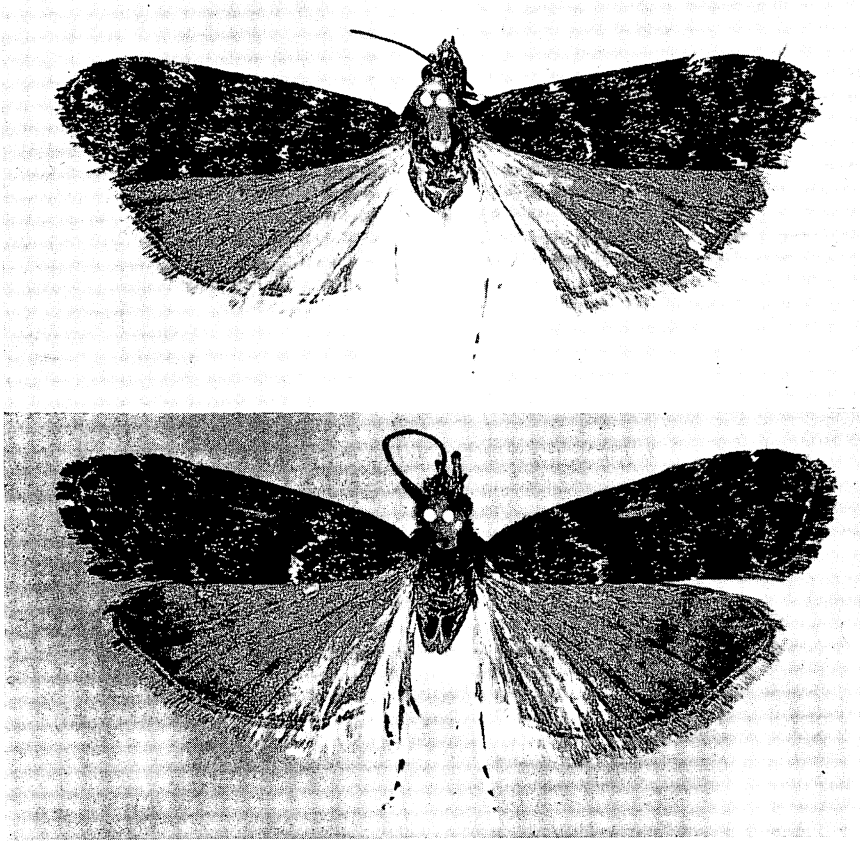


Figure 193—*Scoparia oenopsis* Meyrick. Above: The female type; Haleakala, Maui, 5,000 feet; expanse, 24 mm. Below: The male type of the synonym *gymnopsis* Meyrick; Molokai, 4,500 feet; expanse, 21 mm.; note the "sex spots" near the middles of the fore wings; (this photograph is too dark).

Scoparia erebochalca Meyrick (fig. 183).

Scoparia erebochalca Meyrick, 1899:264; 1904:133.

Endemic. Molokai, Hawaii (type locality: Kilauea).

Hostplant: Unknown.

Scoparia formosa (Butler) (fig. 184).

Scoparia jucunda variety *formosa* Butler, 1881:331.

Xeroscopa formosa (Butler) Meyrick, 1888:237.

Scoparia formosa (Butler) Meyrick, 1899:257; 1904:133.

Endemic. Oahu, Maui (type locality: Haleakala, about 4,000 feet).

Hostplant: Unknown.

Scoparia frigida Butler (fig. 184).

Scoparia frigida Butler, 1881:331. Meyrick, 1888:231; 1899:270.

Endemic. Maui (type locality: Haleakala, 4,000 feet), Lanai.

Hostplant: Unknown.

Scoparia geraea Meyrick (figs. 185, 204).

Scoparia geraea Meyrick, 1899:269, pl. 7, fig. 23; 1904:365.

Endemic. Kauai, Oahu (type locality: Waianae Mountains, 2,000 to 3,000 feet), Hawaii.

Hostplant: Unknown.

The abdomen on the holotype is broken.

Scoparia gonodecta Meyrick (figs. 185, 205).

Scoparia gonodecta Meyrick, 1904:362 (misnamed *mesoleuca* by Meyrick, 1899:252).

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Meyrick did not designate his type, and I have selected a lectotype from his series in the British Museum.

Scoparia halirrhoa Meyrick (fig. 185).

Scoparia halirrhoa Meyrick, 1899:255.

Endemic. Hawaii (type locality: Hilo, 2,000 feet).

Hostplant: Unknown.

Scoparia hawaiiensis Butler (fig. 186).

Scoparia hawaiiensis Butler, 1881:330. Meyrick, 1899:267; 1904a:364; 1904b:133.

Xeroscopa hawaiiensis (Butler) Meyrick, 1888:235.

Scoparia hawaiiensis Klima, 1937:40, misspelling.

Endemic. Oahu, Molokai, Maui, Hawaii (type locality: Mauna Kea, 7,000 feet).

Hostplant: Unknown.

Scoparia ianthes Meyrick (figs. 186, 205, 209).

Scoparia ianthes Meyrick, 1899:261, pl. 7, fig. 17.

Scoparia nectarias Meyrick, 1899:262, pl. 7, fig. 18. **New synonym.**

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet), Oahu, Lanai, Hawaii.

Hostplant: Unknown.

The "sex spot" in the fore wing of the male is feebly developed, as compared with that of *oenopis*.

I have been unable to distinguish *nectarias* from *ianthes*, and I must reduce it to synonymy. The type of *nectarias* came from Lanai. The pattern in the fore wing is variable, and *nectarias* is the female.

Scoparia ischnias (Meyrick) (fig. 187).

Xeroscopa ischnias Meyrick, 1888:235.

Scoparia ischnias (Meyrick) Meyrick, 1899:271, pl. 7, fig. 24.

Endemic. Maui (type locality: not more accurately known, but probably Haleakala).

Hostplant: Unknown.

Meyrick described this species from one female collected by Blackburn and carrying the label "Hawaiian Is. T.B./81." Meyrick did not label the specimen as type. I have designated it as lectotype.

This species is closely similar to *bucolica macrophanes*, but the antennae are different.

Scoparia isophaea Meyrick (fig. 187).

Scoparia isophaea Meyrick, 1904:132.

Scoparia isoplaca Klima, 1937:39, misspelling.

Endemic. Molokai (type locality: 3,000 feet).

Hostplant: Unknown.

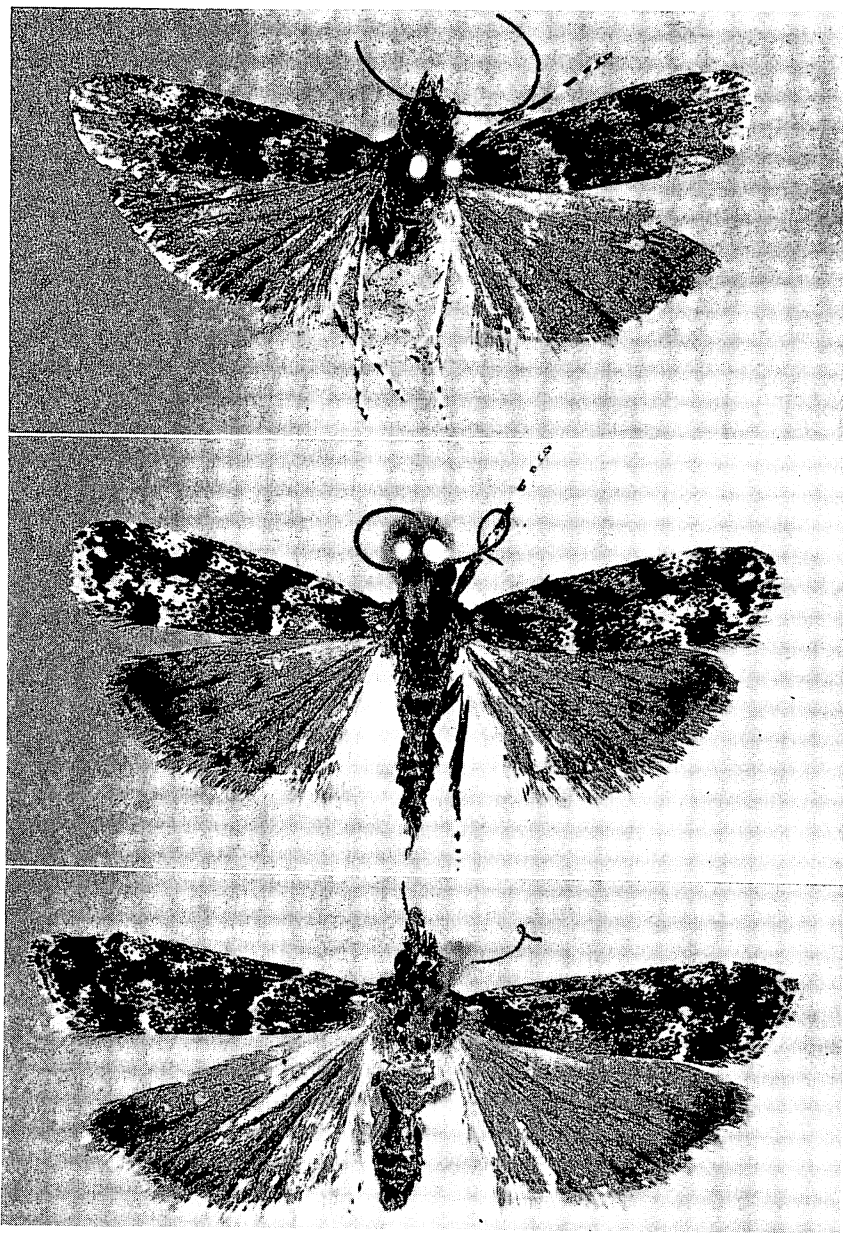


Figure 194—*Scoparia*. Above: *ombrodes ombrodes* (Meyrick), lectotype; "Hawaiian Is. T.B./81" (Blackburn); expanse, 15 mm. Center: The same species from the type of the synonym *calactis* Meyrick; southeast Koolau Mts., Oahu; expanse, 14 mm. Below: *ombrodes perkinsi* Zimmerman, type; Kona, Hawaii; expanse, 16.25 mm.

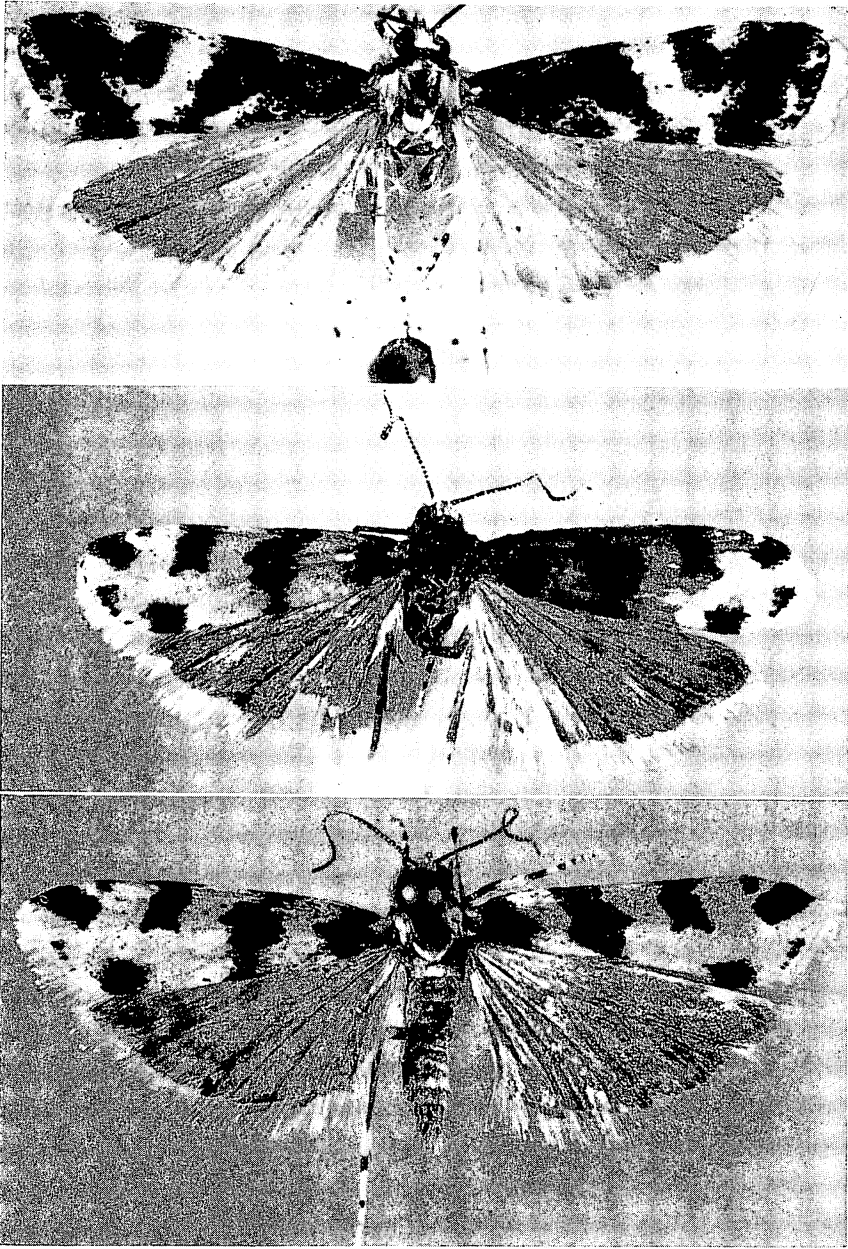


Figure 195—*Scoparia*. Above: *orthoria* Meyrick, type; Olaa, Hawaii; expanse, 16 mm. Center: *oxythyma* Meyrick, type; Waimea Mts., Kauai, 4,000 feet; expanse, 16 mm.; wings grease-stained. Below: Another example of the same species from the type series; Kaholuamano, Kauai, 4,000 feet; expanse, 18 mm.

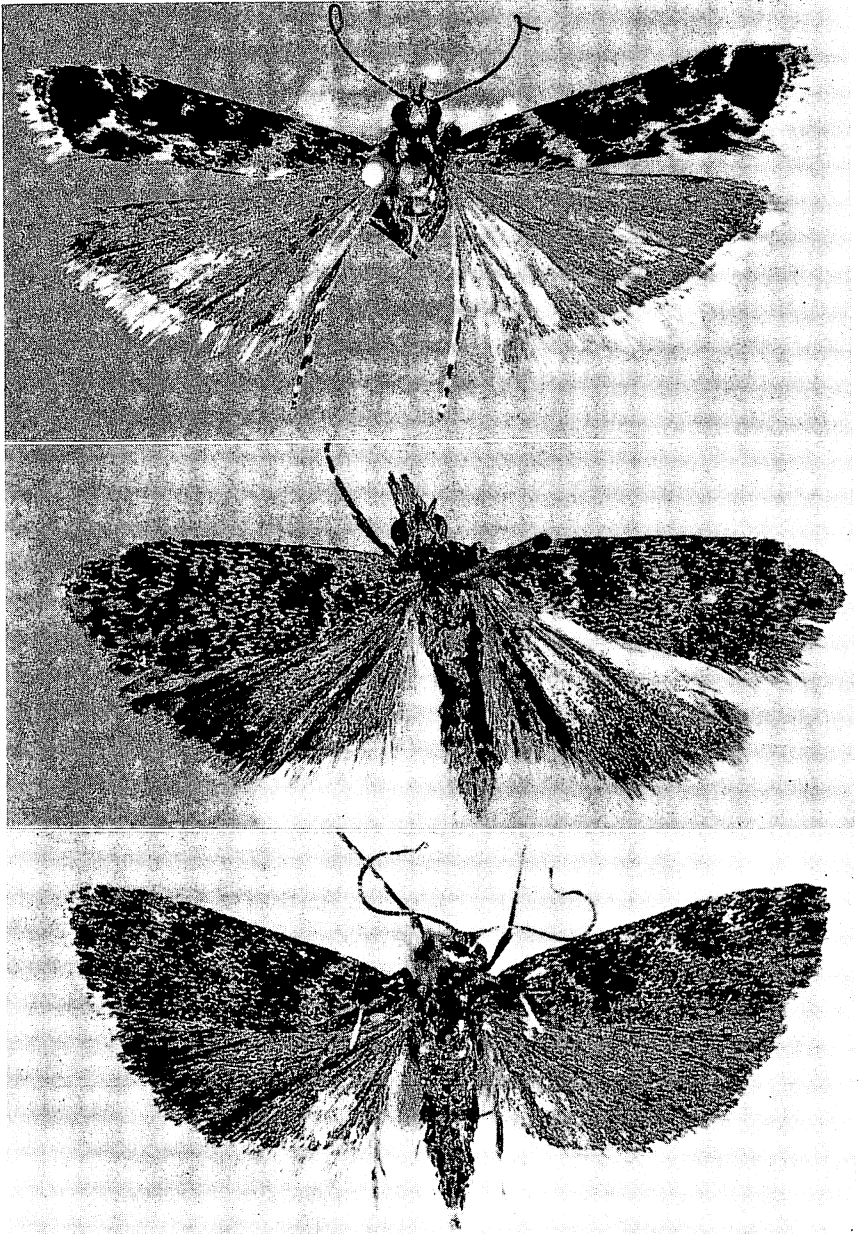


Figure 196—*Scoparia*. Above: *pachysema* (Meyrick), type; "Hawaiian Is. T.B./81" (Blackburn); expanse, 17 mm. Center: *parachlora* Meyrick, type; Olaa, Hawaii, 2,000 feet; expanse, 14 mm. Below: A specimen of *parachlora* in better condition; from the type series; Olaa, Hawaii, 2,000 feet; expanse, 13.5 mm.

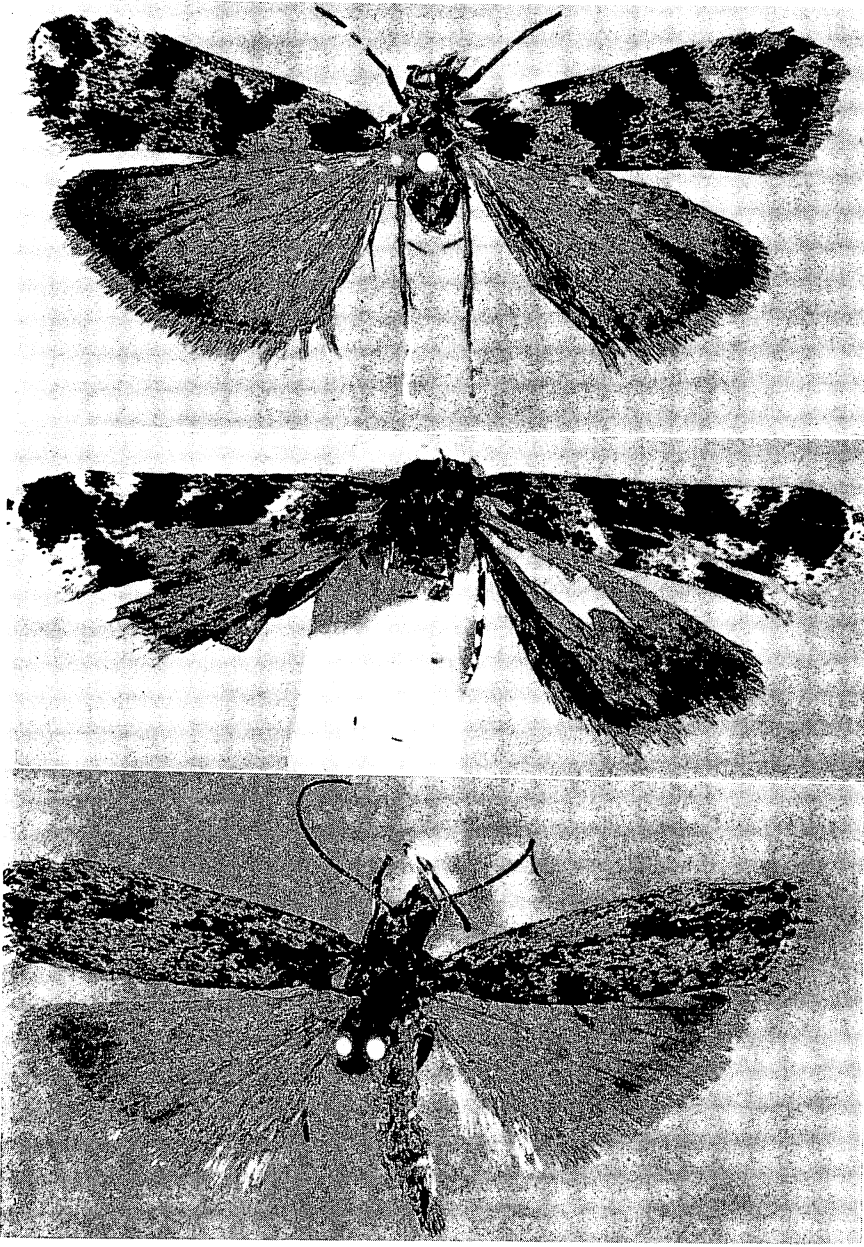


Figure 197—*Scoparia*. Above: *passalota* Meyrick, type; Haleakala, Maui, 5,000 feet; expanse, 18 mm. Center: *pentaspila* Meyrick, type; Kaala Mts., Oahu, 2,000 feet; expanse, 15 mm. Below: *peronetis* Meyrick, type; Kona, Hawaii, 3,000 feet; expanse, 17 mm.

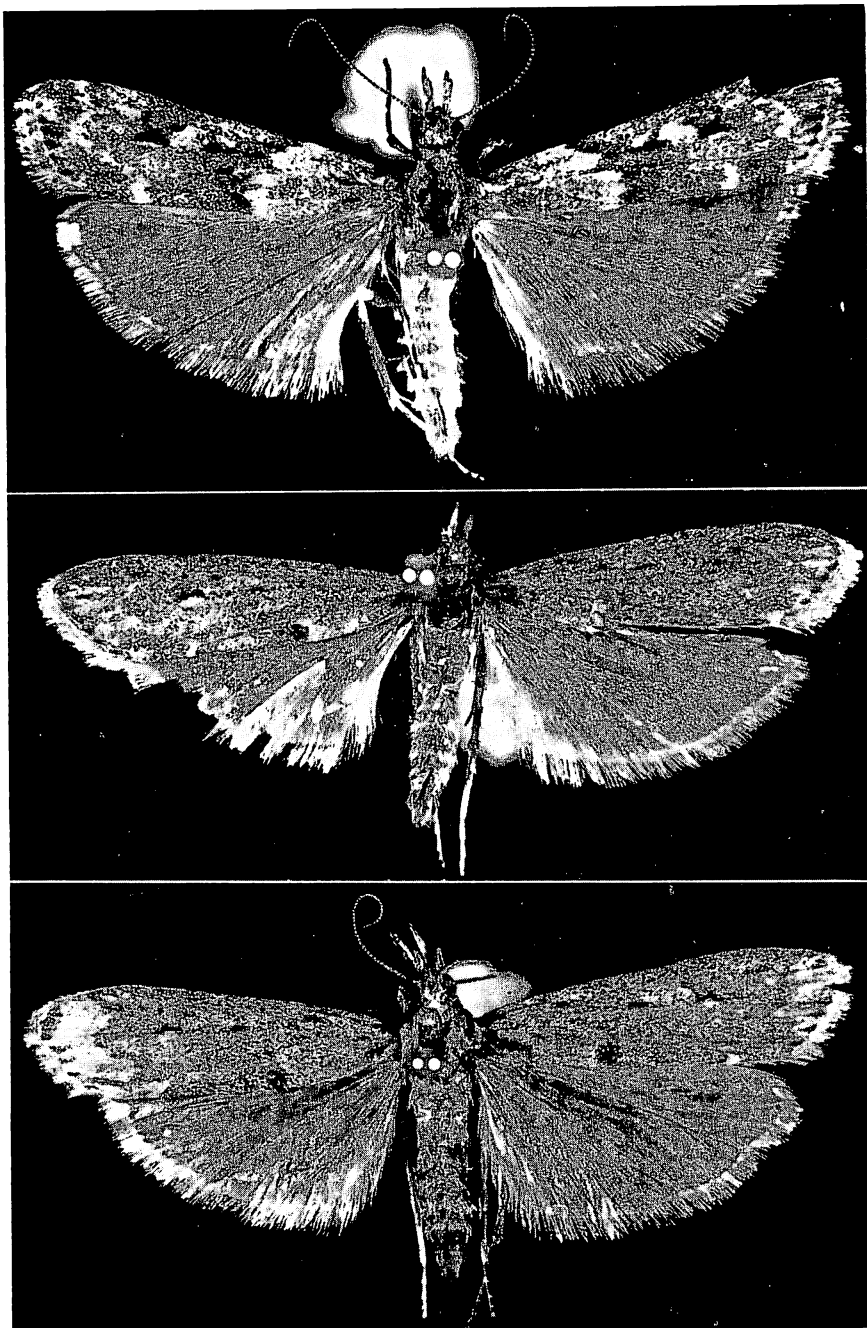


Figure 198—*Scoparia*. Above: *probolaea* Meyrick, type; Waimea Mts., Kauai, 4,000 feet; expanse, 24 mm. Center: The type of the synonym *omichlopis* Meyrick; with the same data; expanse, 23 mm. Below: An example of *omichlopis* in better condition; Kaholuamano, Kauai, 4,000 feet; expanse, 26 mm.

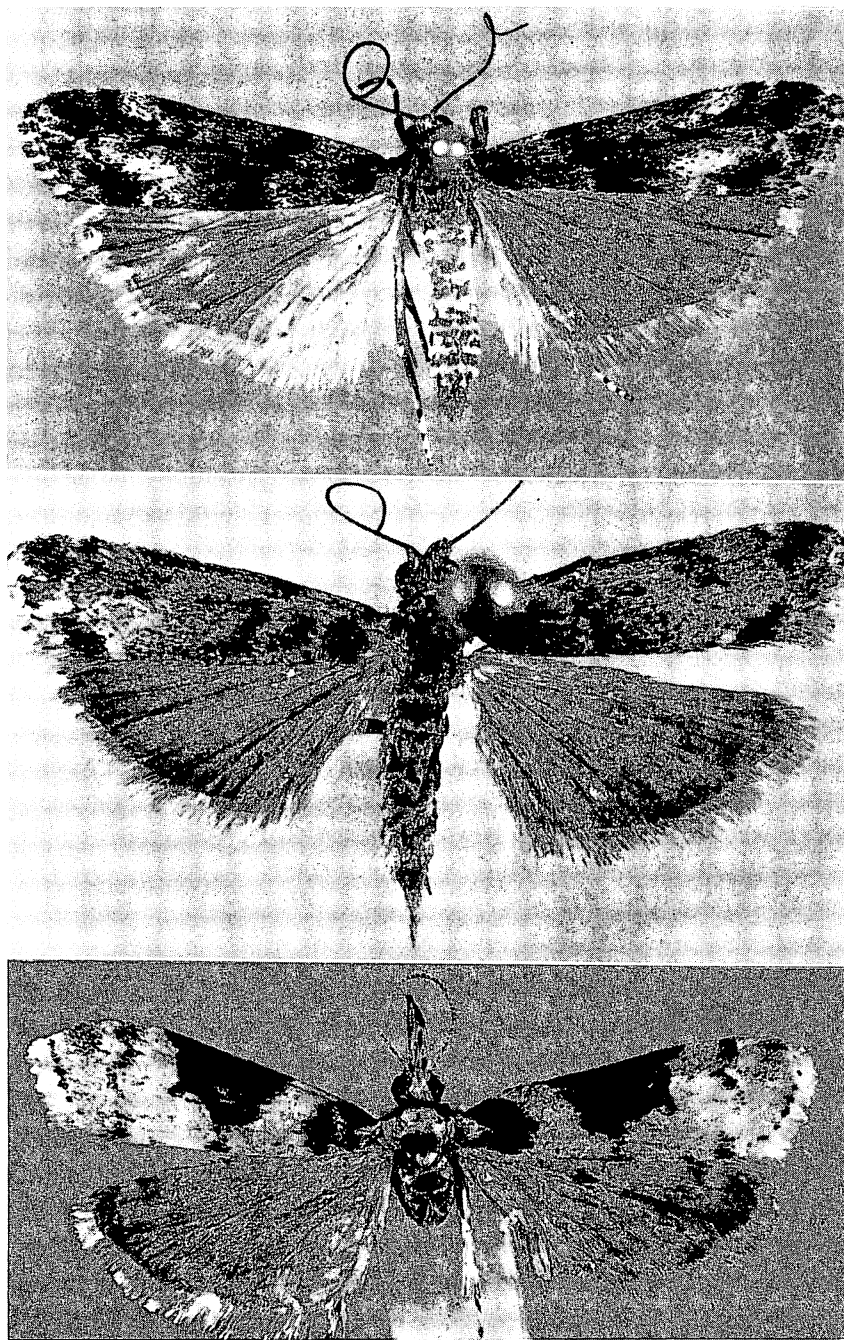


Figure 199—*Scoparia*. Above: *platyscia* Meyrick, type; Waimea Mts., Kauai, 3,000–4,000 feet; expanse, 24 mm. Center: *religiosa* Meyrick, type; northwest Koolau Mts., Oahu; expanse, 14 mm. Below: *rhombias* Meyrick, type; Kaholuamano, Kauai, 4,000 feet; expanse, 17 mm.

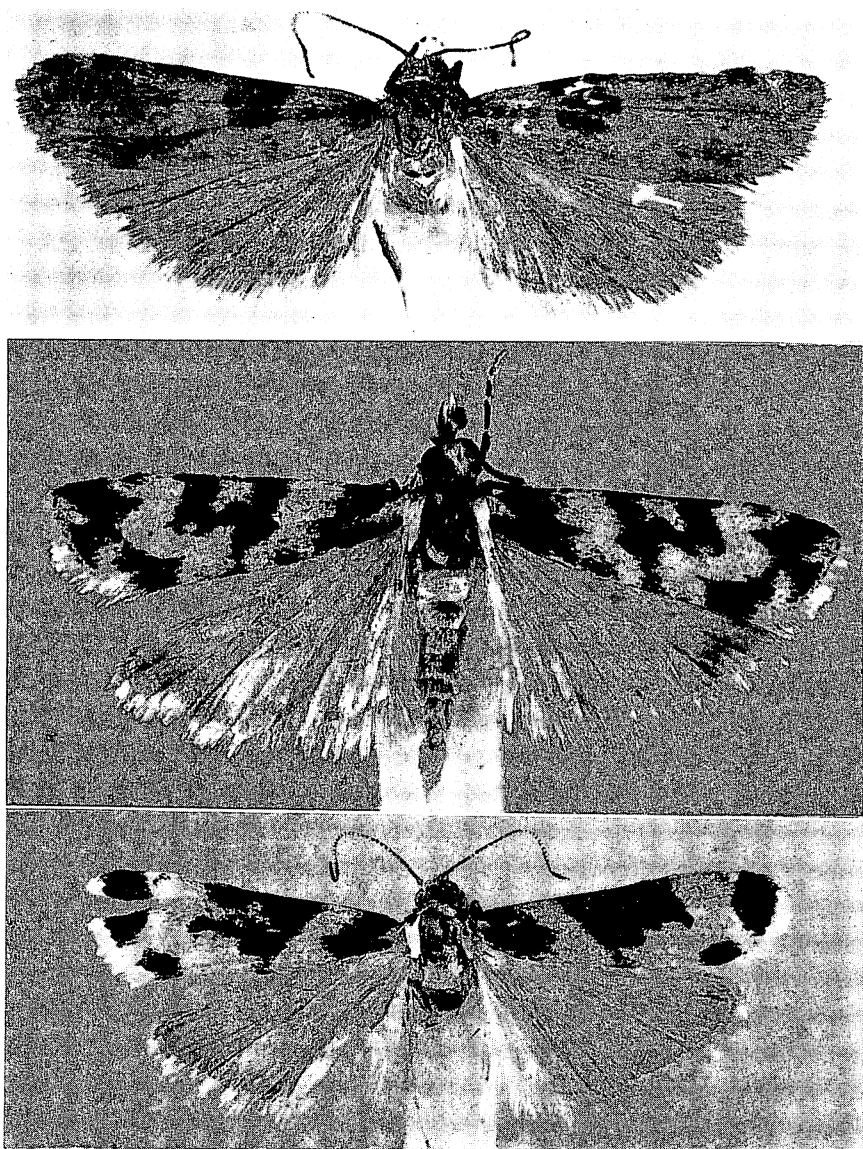


Figure 200—*Scoparia*. Above: *siderina* Meyrick, type; Waimea Mts., Kauai, 4,000 feet; expanse, 16 mm. Center: *struthias* Meyrick, type; Waimea Mts., Kauai, 3,000–4,000 feet; expanse, 16.5 mm. Below: *tetranesa* Meyrick; Haleakala, Maui, 5,000 feet; expanse, 15.5 mm.

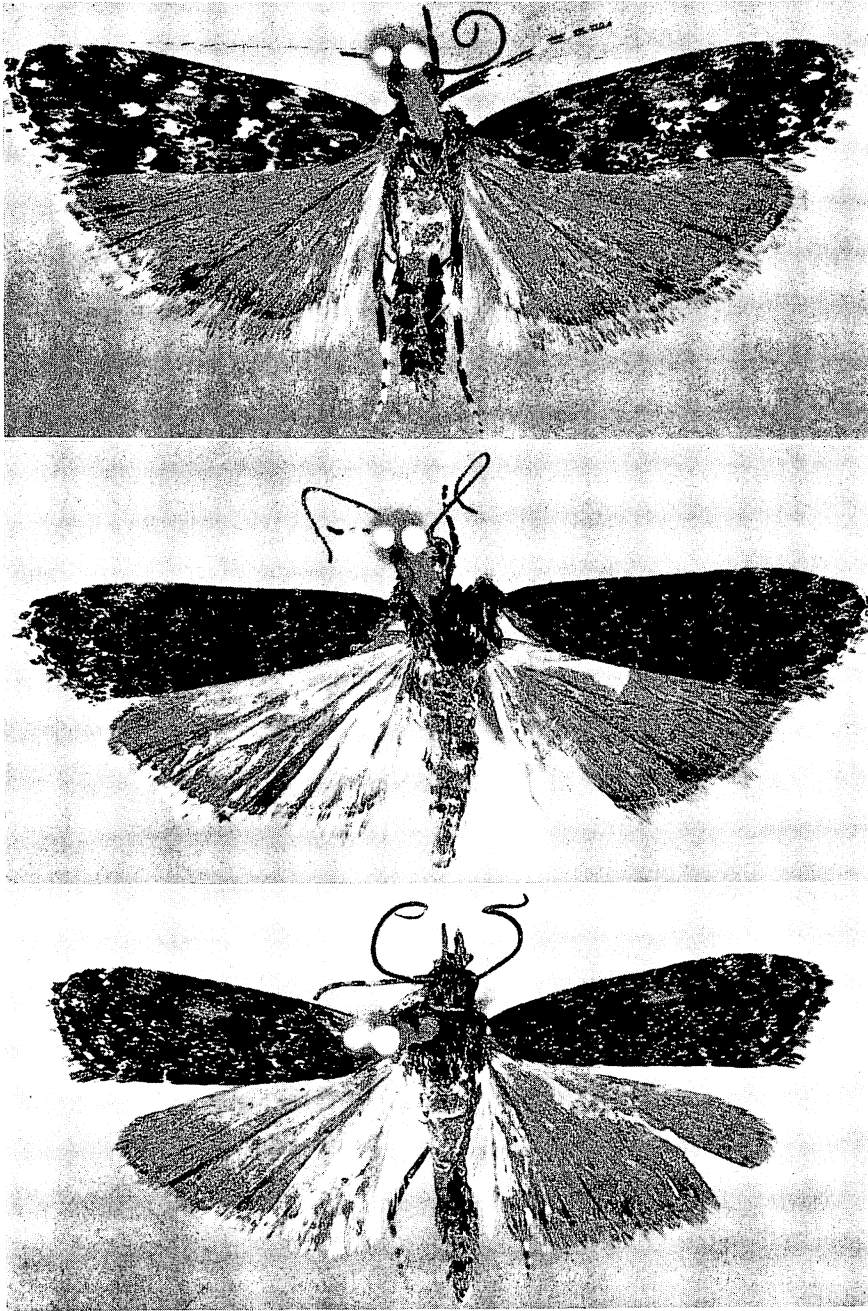


Figure 201—*Scoparia*. Above: *thalamias* Meyrick, type; Waimea Mts., Kauai, 3,000–4,000 feet; expanse, 18.5 mm. Center: *thyellopis* Meyrick, female type; Waimea Mts., Kauai, 4,000 feet; expanse, 20 mm. Below: A male *thyellopis* from the type series; same locality data; expanse, 18 mm.; note the “sex spots” on the fore wings.

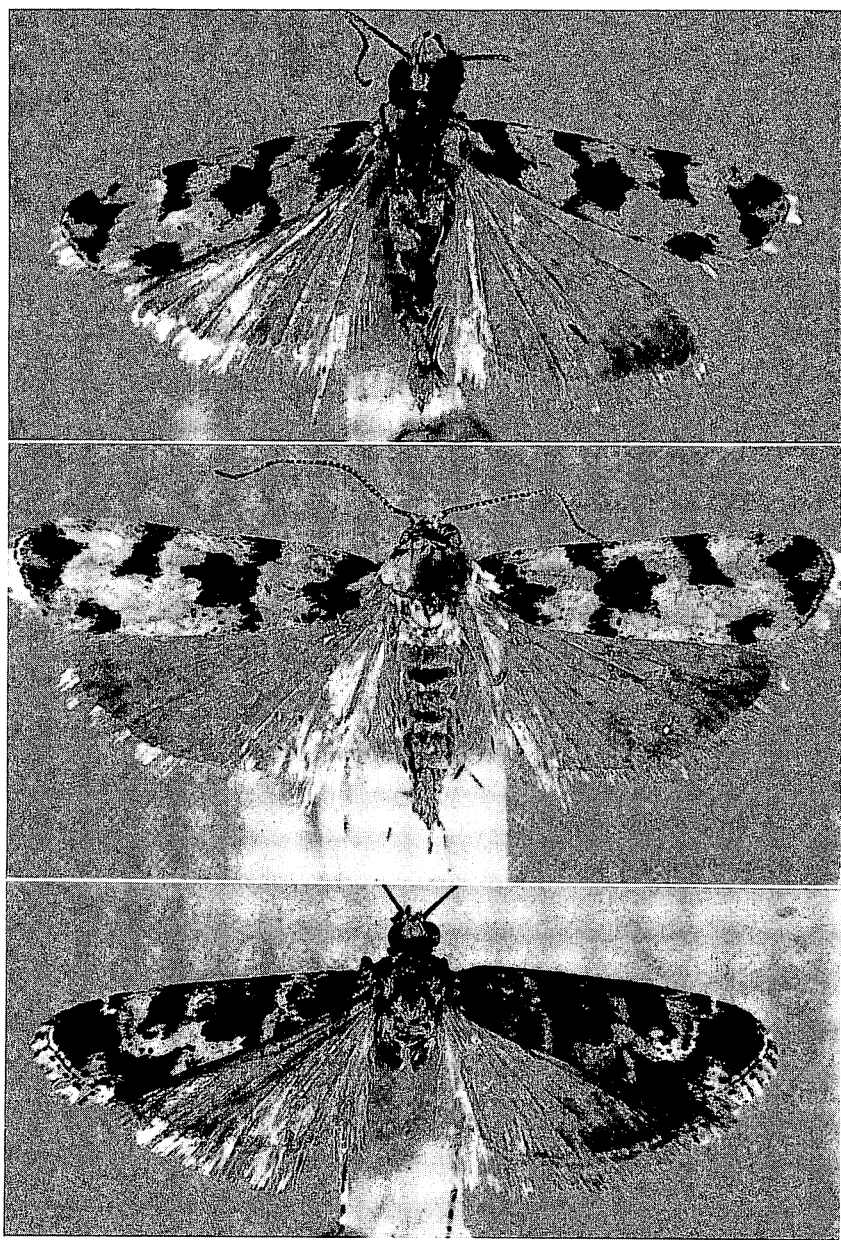


Figure 202—*Scoparia*. Above: *triacma* Meyrick, type; Waimea Mts., Kauai, 4,000 feet; right wing length, 6.75 mm.; a poorly mounted example. Center: An example of the same species in better condition; from the type series; Kaholuamano, Kauai; expanse, 14 mm. Below: *tyraula* Meyrick, the type; Waimea Mts., Kauai, 4,000 feet; expanse, 17 mm.; wings discolored by grease.

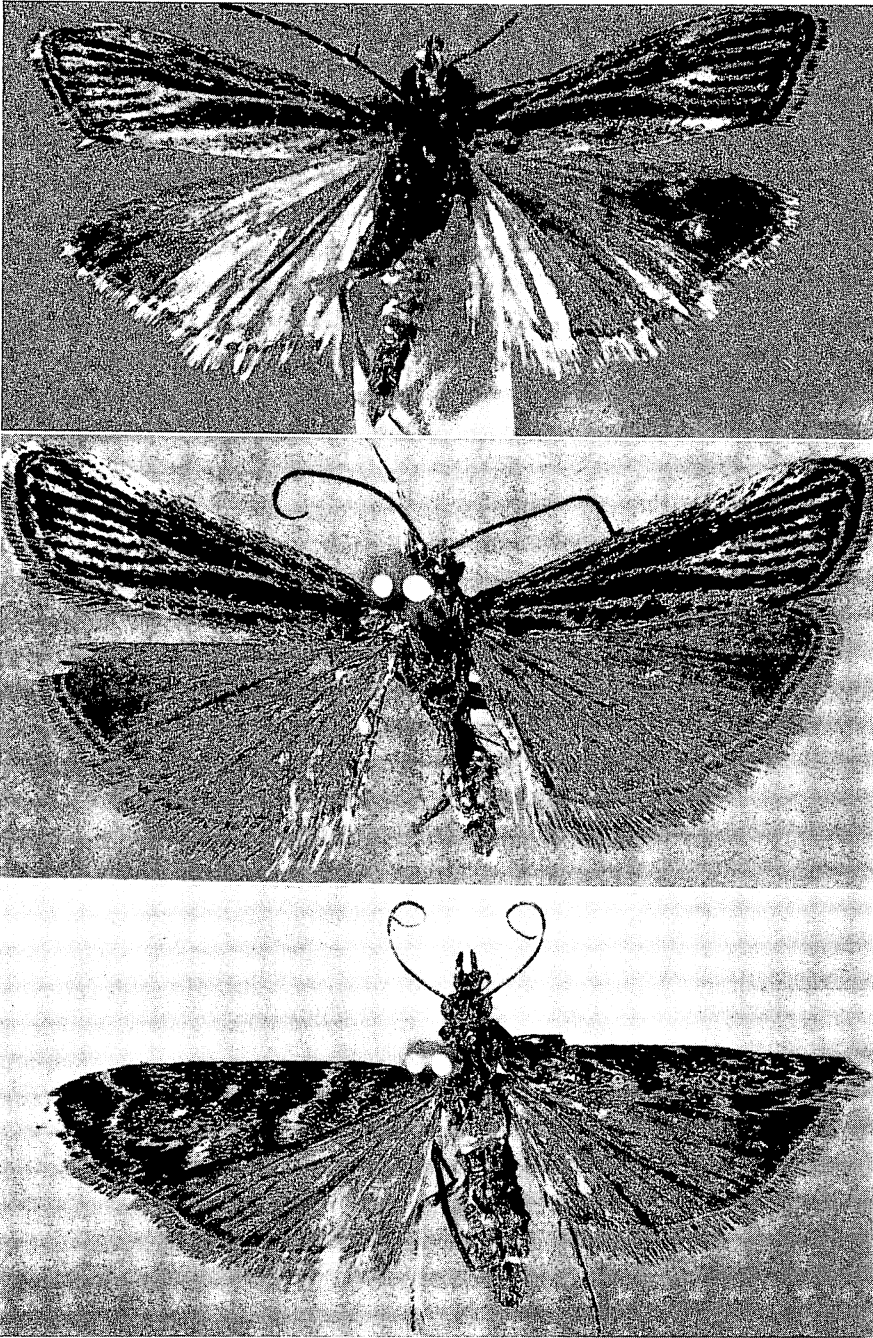


Figure 203—*Scoparia*. Above: *venosa* Butler, type; "Hawaiian Islands 81-7 84" (Blackburn); expanse, 16 mm. Center: The same species; Kona, Hawaii, 4,000 feet; expanse, 17.5 mm. Below: *zophochlora* Meyrick, type; Molokai Mts., over 4,500 feet; expanse, 20 mm.; right wing broken and anterior part folded ventrad.

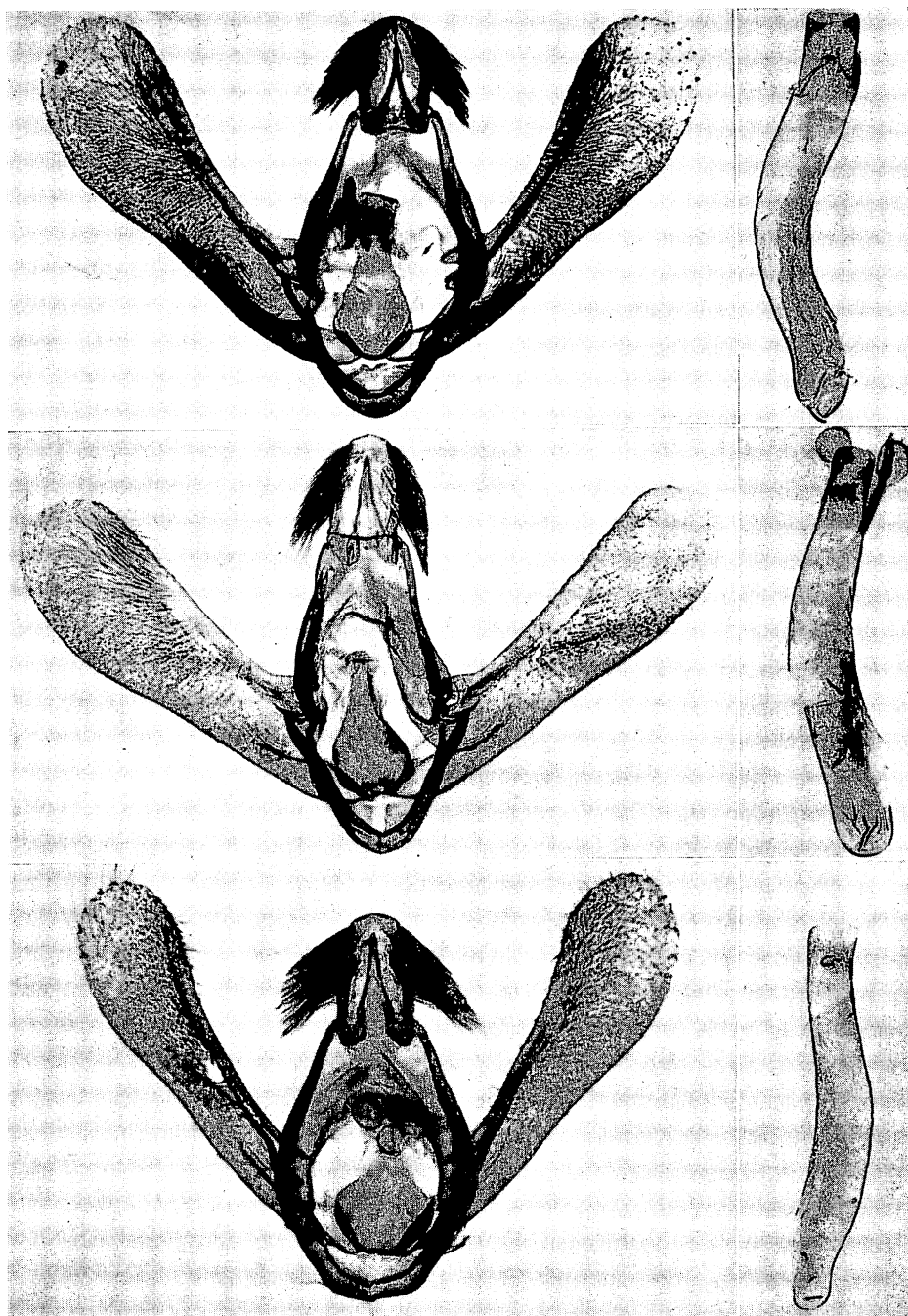


Figure 204—Male genitalia of *Scoparia*. Above: *amphicypella* Meyrick, type; Kauai. Center: *balanopsis* Meyrick, type; Hawaii. Below: *geraea* Meyrick; Hawaii. Note how closely similar all of the genitalia are.

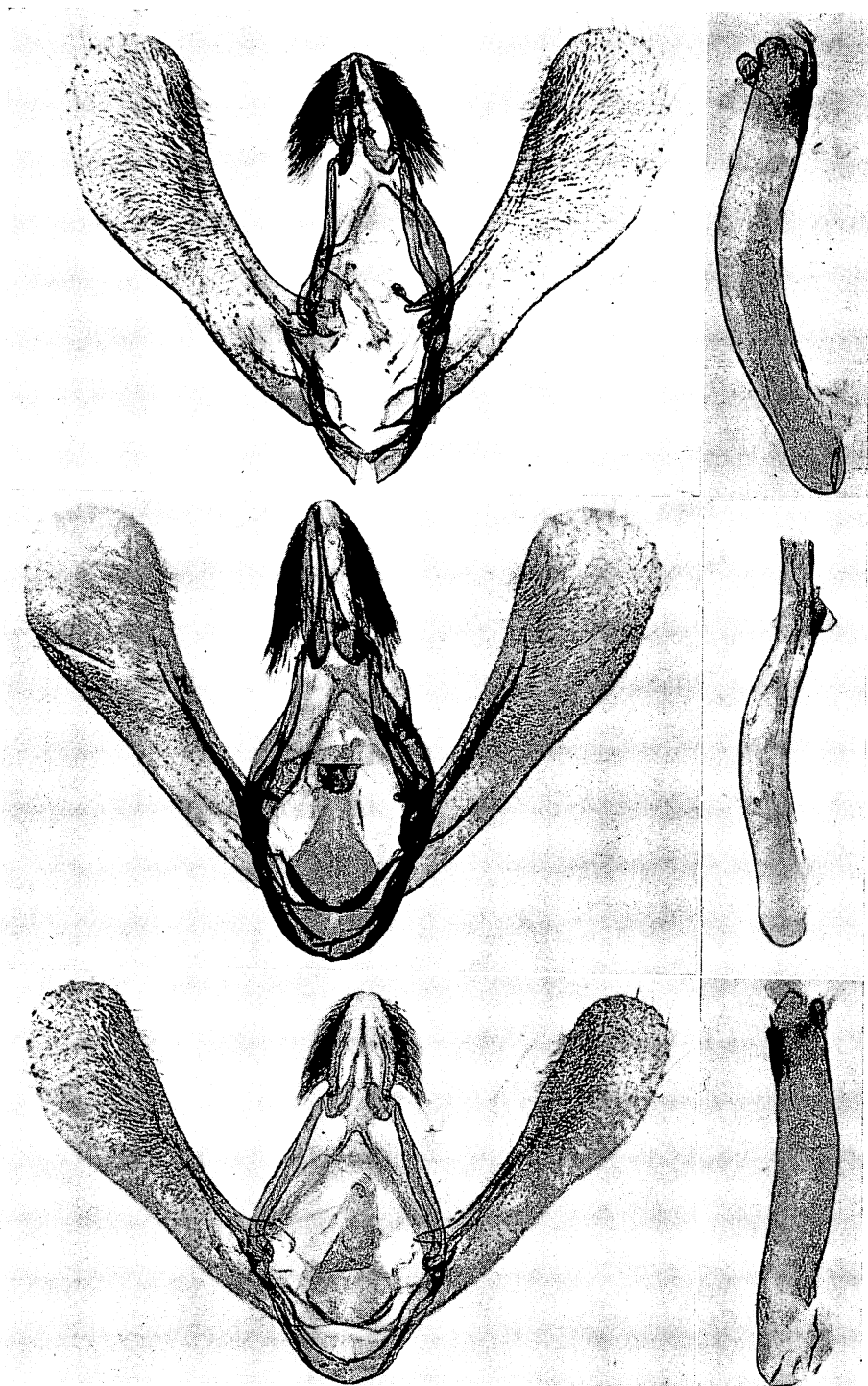


Figure 205—Male genitalia of *Scoparia*. Above: *gonodecta* Meyrick, type; Kauai. Center: *oenopsis* Meyrick from the type of *gymnopsis* Meyrick, a synonym; Molokai. Below: *ianthes* Meyrick, type; Kauai.

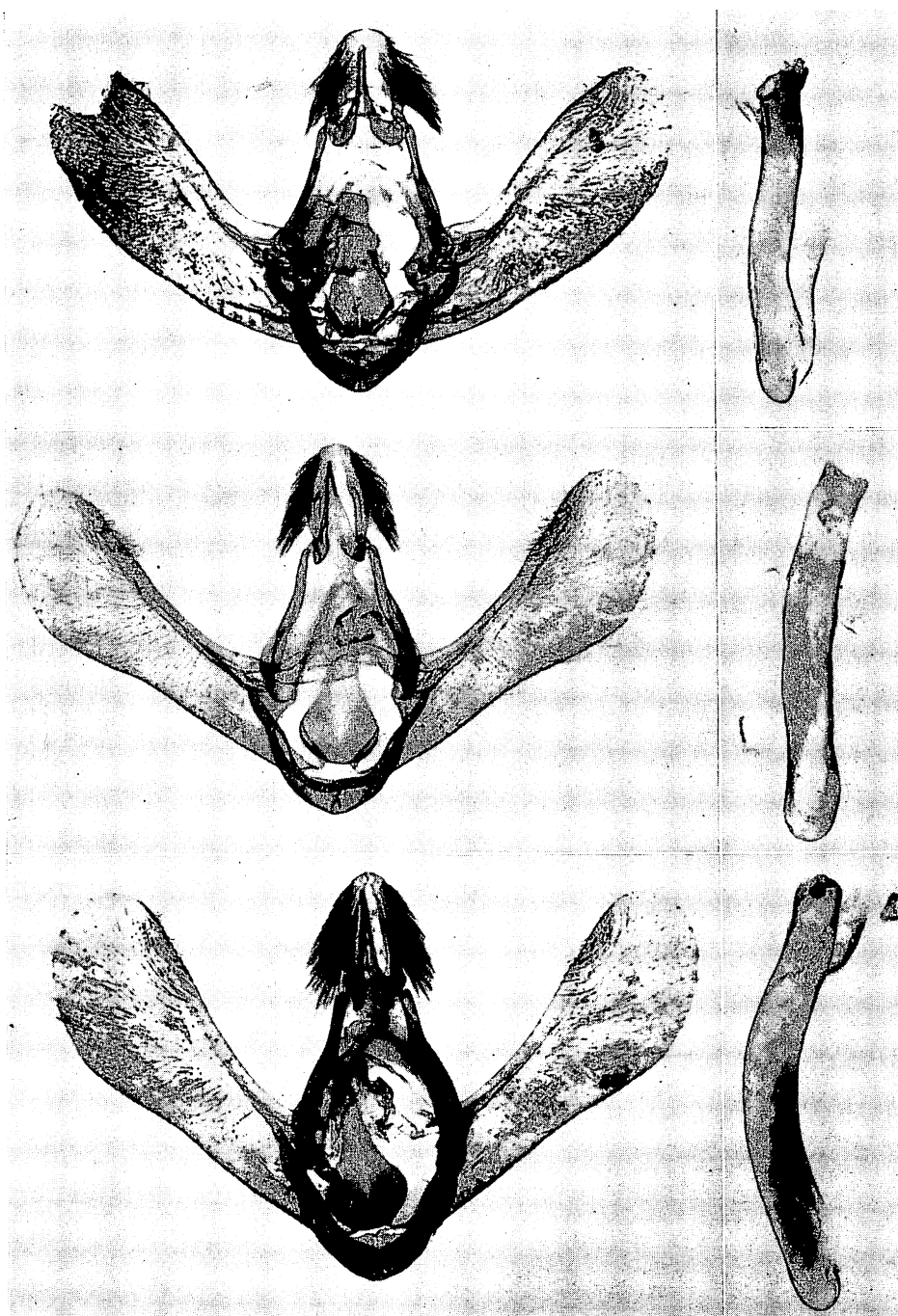


Figure 206—Male genitalia of *Scoparia*. Above: *lycopodiae* Swezey; Oahu. Center: *mesoleuca* (Meyrick); Oahu. Below: *miantis* Meyrick, type; Molokai.

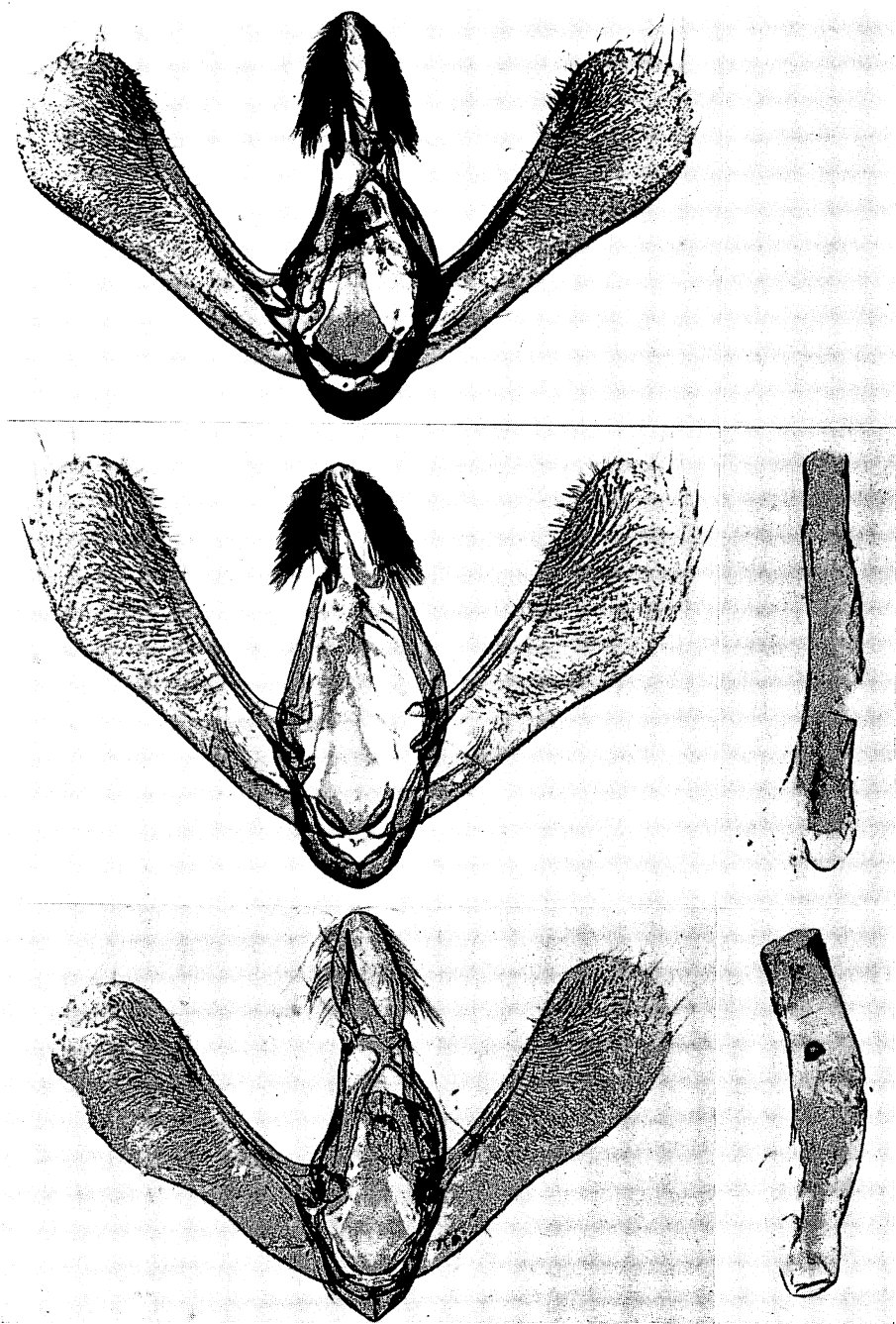


Figure 207—Male genitalia of *Scoparia*. Above: *oenopsis* Meyrick; Maui. Center: *oxythyma* Meyrick, type; Kauai. Below: *pentaspila* Meyrick; Oahu.

Scoparia jucunda Butler (fig. 188).

Scoparia jucunda Butler, 1881:331. Meyrick, 1899:258; 1904:133.

Xeroscopa jucunda (Butler) Meyrick, 1888:238.

Endemic. Oahu, Lanai, Hawaii (type locality: Mauna Kea, about 7,000 feet).

Hostplant: Unknown.

Scoparia loxocentra Meyrick (fig. 188).

Scoparia loxocentra Meyrick, 1899:255, pl. 7, fig. 9.

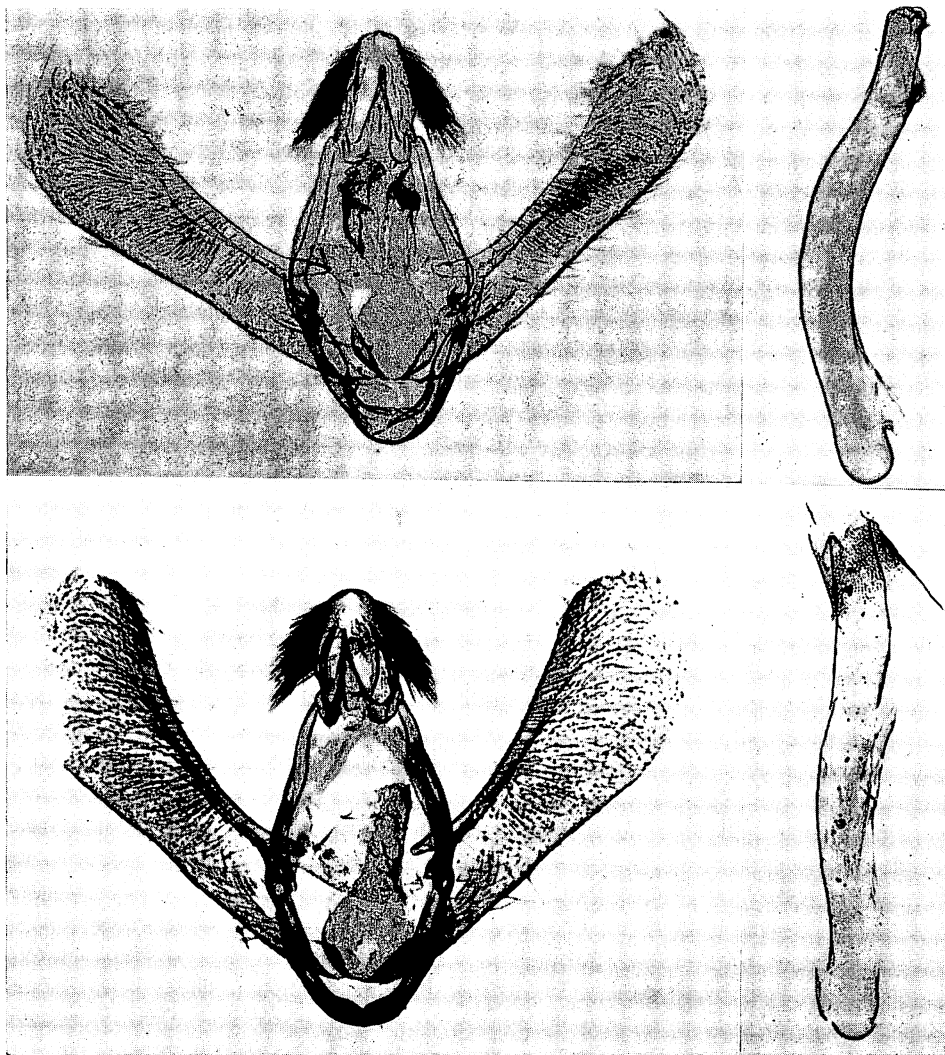


Figure 208—Male genitalia of *Scoparia*. Above: *probolaea* Meyrick; Kauai. Below: *siderina* Meyrick; Kauai.

Endemic. Hawaii (type locality: Kilauea).

Hostplant: Unknown.

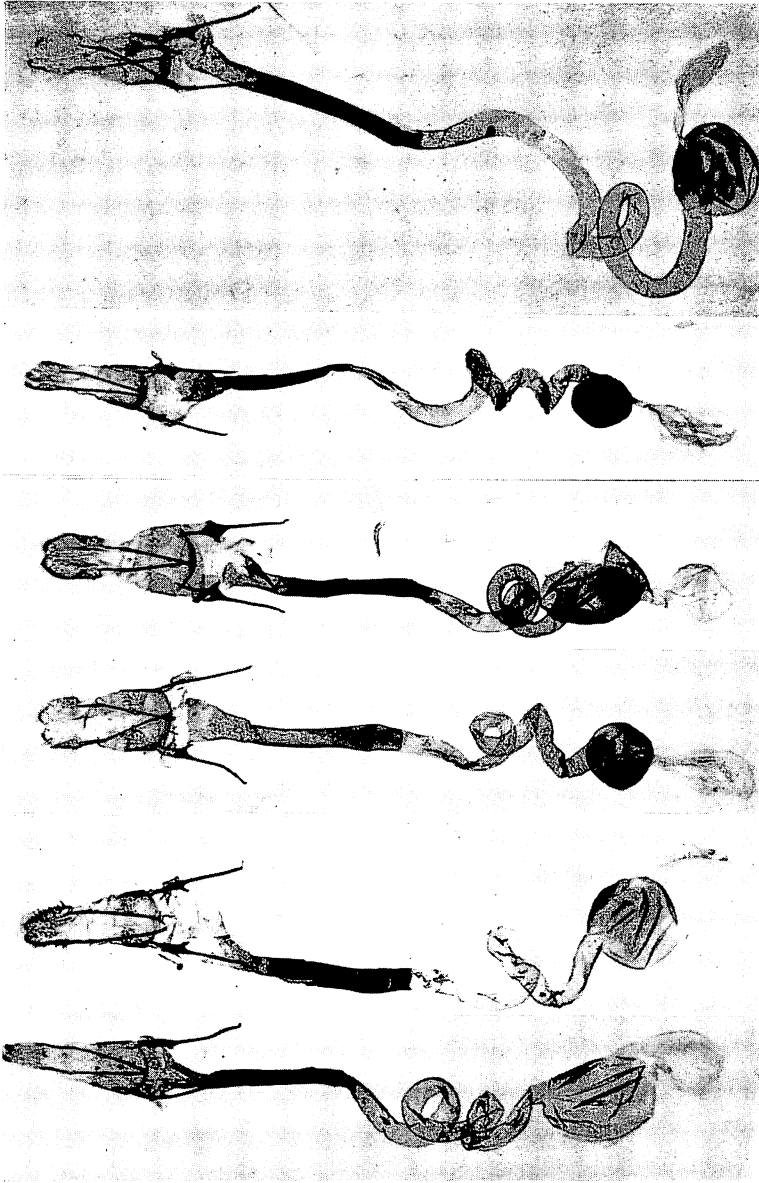


Figure 209—Female genitalia of *Scopariinae*. From top to bottom: *balanopsis* Meyrick, Hawaii; *ianthes* Meyrick, Hawaii; *nyctombra* Meyrick, type, Molokai; *passalota* Meyrick, Maui; *rhombias* Meyrick, type, Kauai; *venosa* Butler, Molokai. Note the close similarity of all.

Scoparia lycopodiae Swezey (figs. 188, 206).

Scoparia lycopodiae Swezey, 1910:104, pl. 3, fig. 2.

Endemic. Oahu (type locality: Koolau Mountains, above Wahiawa, about 1,800 feet).

Hostplant: *Lycopodium cernuum*.

The discovery that the caterpillar of this species is a stem-borer in *Lycopodium* is one of the most interesting of all of the many interesting observations made by Dr. Swezey. At the time of his original description, he said:

... attention was attracted by the numerous dead tips of the plant, which on examination disclosed the fact that they had been bored for several inches by some insect. . . . The larva apparently enters when quite small and bores downward in the middle of the stem. Having become full-grown, it gnaws a round hole nearly through to the exterior, then pupates just below, where it can readily emerge through the hole at the final transformation.

The full-grown larva is about 15 mm., pale shiny green; head pale yellowish mottled with light brown, eyes and posterior margin blackish; cervical shield concolorous; skin minutely papillose except on tubercles; tubercles broadly rounded or oval, "ii" farther apart than "i," "iii" above spiracle, "iv + v" below spiracle; hairs black, pale tipped; spiracles round, black. A larva but 9 mm. long has head and cervical shield black.

Pupa, 7.5 mm., pale yellowish, eyes, spiracles and apical segment of abdomen brownish; wing-cases extend nearly to apex of 4th abdominal segment; cremaster with 4 curved diverging bristles situated on a minute rounded projection; a large transverse dorsal callosity on terminal segment of abdomen.

Swezey's illustration is not good.

Scoparia marmarias Meyrick (fig. 189).

Scoparia marmarias Meyrick, 1899:261; 1904b:133.

Endemic. Oahu, Molokai, Maui, Hawaii (type locality: Hilo, 2,000 feet).

Hostplant: Unknown.

Scoparia melanocephala Meyrick (fig. 189).

Scoparia melanocephala Meyrick, 1899:256.

Endemic. Hawaii (type locality: Kona, 4,000 feet).

Hostplant: Unknown.

Scoparia melichlora Meyrick (fig. 189).

Scoparia melichlora Meyrick, 1899:266, pl. 7, fig. 21.

Endemic. Hawaii (type locality: Hilo, 2,000 feet).

Hostplant: Moss.

Scoparia meristis meristis Meyrick (fig. 190).

Scoparia meristis Meyrick, 1899:272; 1904a:365.

Scoparia frigida, misidentification by Meyrick, 1888:231.

Endemic. Oahu, Molokai, Hawaii (type locality: Kona, 4,000 feet).

Hostplant: Moss.

Scoparia meristis halmaea (Meyrick), **new status** (fig. 190).

Scoparia halmaea Meyrick, 1899:272, pl. 7, fig. 25.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

I consider this form to be a subspecies of *meristis*. It may be confined to Kauai, but Oahu specimens in collections which have been determined as this form should be checked. It is possible that it also occurs on Oahu, but at this writing I consider it a Kauai subspecies.

Scoparia mesoleuca (Meyrick) (figs. 190, 206).

Xeroscopa mesoleuca Meyrick, 1888:237.

Scoparia mesoleuca (Meyrick) Meyrick, 1904a:363.

The description of "*mesoleuca*" by Meyrick, 1899:252 applies to *gonadecta*.

Endemic. Oahu (type locality not more precisely known).

Hostplant: Swezey (1954:230) said, "Reared from dead branches."

The only Blackburn example in the Meyrick collection is labeled "Hawaiian Is. T.B./81," and I have labeled it lectotype. The other three examples in Meyrick's collection were taken by Perkins.

Scoparia miantis Meyrick (figs. 191, 206).

Scoparia miantis Meyrick, 1899:252.

Endemic. Molokai (type locality: 3,500 feet).

Hostplant: Unknown.

Scoparia montana (Butler) (fig. 191).

Scoparia coarctata Zeller, variety ? *montana* Butler, 1882:41.

Xeroscopa melanopsis Meyrick, 1888:233.

Scoparia melanopsis (Meyrick) Meyrick, 1899:271. **New synonym.**

Endemic. Oahu (type locality: mountains near Honolulu).

Hostplant: Unknown.

Meyrick (1899:271) said, "Two specimens are mentioned by Butler . . . but one of these is, I think, a poor example of *frigida*; the other is this species, and now bears a type-label, which it did not in 1888. Considering this fact, and also that (1) Butler's name is varietal, not specific, being wrongly identified with *angustea* (*coarctata*), (2) there is practically no description accompanying it, I have therefore not used his name." I consider Meyrick's action incorrect, and I have used Butler's original name.

The Butler type bears the Blackburn label "Hawaiian Isls. 82.9 (160)." The specimen Meyrick used as the type (unmarked) of his *melanopsis*, and which I have designated as lectotype, bears the Blackburn label "Hawaiian Is. T.B./81."

Scoparia nectarioides Swezey (fig. 192).

Scoparia nectarioides Swezey, 1913:273.

Endemic. Hawaii (type locality: Kilauea).

Hostplant: Unknown.

Scoparia nyctombra Meyrick (figs. 192, 209).

Scoparia nyctombra Meyrick, 1899:264.

Endemic. Molokai (type locality: 4,500 feet).

Hostplant: Unknown.

Scoparia oenopis Meyrick (figs. 193, 205, 207).

Scoparia oenopis Meyrick, 1899:264, pl. 7, fig. 19.

Scoparia gymnopis Meyrick, 1904b:131. **New synonym.**

Endemic. Molokai, Maui (type locality: 5,000 feet), Hawaii.

Hostplant: Unknown.

I consider *gymnopis* (type locality: Molokai, 4,500 feet) to be the male of *oenopis* and a new synonym. The "sex spot" in the cell of the fore wing is conspicuously developed.

Scoparia ombrodes ombrodes (Meyrick) (fig. 194).

Xeroscopa ombrodes Meyrick, 1888:234.

Scoparia ombrodes (Meyrick) Meyrick, 1899:260, pl. 7, fig. 14.

Scoparia catactis Meyrick, 1904a:363; 1904b:133. **New synonym.**

Endemic. Oahu (probable type locality), Molokai, Maui ?, Lanai, Hawaii.

Hostplant: Unknown.

The two Blackburn specimens in the Meyrick collection are in bad condition and are badly molded. I have chosen one as lectotype, but it gives a misleading picture of the species because it is so badly abraded and faded. These two original specimens are without locality data; they are simply labeled "Hawaiian Is. T.B./81." However, a careful comparison leads me to believe that they are Oahu examples and that they are the same as the type of *catactis* Meyrick. Hence, I have reduced *catactis* to synonymy.

Scoparia ombrodes perkinsi Zimmerman, **new subspecies** (fig. 194).

Scoparia ombrodes of Meyrick, 1904a:364, not Meyrick, 1888:234.

Endemic. Oahu, Molokai, Lanai, Hawaii (type locality: Kona).

Hostplant: Unknown.

The darker form which Meyrick described under the name "*ombrodes*" in *Fauna*

Hawaiiensis (1904:364), is not like his type of *ombrodes*, which equals *catactis*. Hence, *ombrodes* of Meyrick, 1904, needs a new name, and I propose to call this darker form *perkinsi*. The holotype is in the British Museum.

Scoparia orthoria Meyrick (fig. 195).

Scoparia orthoria Meyrick, 1899:251, pl. 7, fig. 6.

Endemic. Hawaii (type locality: Olaa, 2,000 feet).

Hostplant: Unknown.

Scoparia oxythyma Meyrick (figs. 195, 207).

Scoparia oxythyma Meyrick, 1899:250.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Scoparia pachysema (Meyrick) (fig. 196).

Xeroscopa pachysema Meyrick, 1888:236.

Scoparia pachysema (Meyrick) Meyrick, 1899:254.

Endemic. Maui ? (type locality: Haleakala ?).

Hostplant: Unknown.

The unique female type of this species bears only the Blackburn label "Hawaiian Is. T.B./81." It was Meyrick's guess that the species came from Haleakala.

Scoparia parachlora Meyrick (fig. 196).

Scoparia parachlora Meyrick, 1899:261, pl. 7, fig. 16.

Endemic. Hawaii (type locality: Olaa, 2,000 feet).

Hostplant: Unknown.

Scoparia passalota Meyrick (figs. 197, 209).

Scoparia passalota Meyrick, 1899:251.

Endemic. Maui (type locality: Haleakala, 5,000 feet).

Hostplant: Unknown.

Scoparia pentaspila Meyrick (figs. 197, 207).

Scoparia pentaspila Meyrick, 1899:253.

Endemic. Oahu (type locality: "Kaala Mountains," 2,000 feet).

Hostplant: Unknown.

The holotype is badly damaged.

Scoparia peronetis Meyrick (fig. 197).

Scoparia peronetis Meyrick, 1899:270.

Endemic. Hawaii (type locality: Kona, 3,000 feet).

Hostplant: Unknown.

Scoparia platyscia Meyrick (fig. 199).

Scoparia platyscia Meyrick, 1899:273, pl. 7, fig. 26.

Endemic. Kauai (type locality: Waimea Mountains, 3,000 to 4,000 feet), Molokai, Hawaii.

Hostplant: Unknown.

Scoparia probolaea Meyrick (figs. 198, 208).

Scoparia probolaea Meyrick, 1899:273, pl. 7, fig. 27.

Scoparia omichlopis Meyrick, 1899:274, pl. 7, fig. 28. **New synonym.**

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet), Hawaii.

Hostplant: Unknown.

The types of *probolaea* and *omichlopis* bear the same field data. I consider them to represent only one species.

Scoparia religiosa Meyrick (fig. 199).

Scoparia religiosa Meyrick, 1904a:365.

Endemic. Oahu (type locality: northwest Koolau Mountains), Hawaii ?

Hostplant: Unknown.

Scoparia rhombias Meyrick (figs. 199, 209).

Scoparia rhombias Meyrick, 1899:249.

Endemic. Kauai (type locality: Kaholuamano, 4,000 feet), Oahu, Molokai.

Hostplant: Unknown.

Scoparia siderina Meyrick (figs. 200, 208).

Scoparia siderina Meyrick, 1899:260, pl. 7, fig. 15.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet), Maui.

Hostplant: Moss.

Scoparia struthias Meyrick (fig. 200).

Scoparia struthias Meyrick, 1899:257, pl. 7, fig. 11.

Endemic. Kauai (type locality: Waimea Mountains, 3,000 to 4,000 feet).

Hostplant: Unknown.

Scoparia tetranesa Meyrick (fig. 200).

Scoparia tetranesa Meyrick, 1899:249, pl. 7, fig. 3.

Endemic. Maui (type locality: Haleakala, 5,000 feet).

Hostplant: Unknown.

Scoparia thalamias Meyrick (fig. 201).

Scoparia thalamias Meyrick.

Endemic. Kauai (type locality: Waimea Mountains, 3,000 to 4,000 feet).

Hostplant: Unknown.

Scoparia thyellopis Meyrick (fig. 201).

Scoparia thyellopis Meyrick, 1899:265.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet), Oahu, Lanai, Hawaii.

Hostplant: Unknown.

Scoparia triacma Meyrick (fig. 202).

Scoparia triacma Meyrick, 1899:258, pl. 7, fig. 12.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Scoparia tyraula Meyrick (fig. 202).

Scoparia tyraula Meyrick, 1899:253, pl. 7, fig. 7.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Scoparia venosa Butler (figs. 203, 209).

Scoparia venosa Butler, 1881:332. Meyrick, 1899:274.

Xeroscopa venosa (Butler) Meyrick, 1888:233; 1904b:133.

Endemic. Molokai, Maui, Hawaii (type locality: "Mauna Loa, Hawaii; elevation about 4,000 feet; occurred very near the active volcanic crater." This locality obviously refers to what we would label "Kilauea" today).

Hostplant: Unknown.

Scoparia zophochlora Meyrick (fig. 203).

Scoparia zophochlora Meyrick, 1899:266.

Endemic. Molokai (type locality: above 4,500 feet).

Hostplant: Unknown.

Swezey (1929:277) recorded this species from Kauai, but I believe that the determination should be checked carefully before the record is accepted.

Subfamily NYMPHULINAE

Nymphulites Duponchel, 1844:201.

Nymphulinae Fernald, in Dyar, 1903 (1902):395.

Hydrocampidae Guenée, 1854:254.

Hydrocampinae Ragonot, 1891:456.

Klima, 1937:57, world catalogue (requires much revision and correction). Lange, 1956, revision and discussion.

The larvae of the Nymphulinae are aquatic. Two immigrant species are established here, and their caterpillars are the only aquatic lepidopterous larvae in Hawaii. Ocelli and chaetosemae are present on the adults of our species.

In the recent paper by Lange (1956) there is assembled a large amount of newly organized data on this unusual group of moths, and the interested worker is referred to Lange's report on the North American fauna. I have to thank my friend Dr. Lange for assistance and suggestions concerning the species found in Hawaii.

Tribe NYMPHULINI Handlirsch, 1925. Lange, 1956:76

KEY TO THE GENERA AND SPECIES ESTABLISHED IN HAWAII

1. Both pairs of wings whitish, with much yellowish coloring, very conspicuously marked, lines prominent; fore wings comparatively pointed; eighth sternite of male simple and without a medial, caudal process; ductus bursae very short, heavily sclerotized basad. **Paraponyx.**
2. Both pairs of wings dark, brown or blackish, rather obscurely marked and without prominently developed lines; fore wings comparatively broadly rounded at apex; eighth sternite of male with the caudal margin drawn out into a sclerotized, sharp, medial process; ductus bursae very long and without especially heavy sclerotization basad.
 **Synclita.**

Genus **PARAPONYX** (Huebner) Guenée, 1854:268

Paraponyx Huebner, 1825:362. Lange, 1956:92, redefinition, discussion.

Paraponyx fluctuosalis (Zeller) (figs. 48, 210, 211, 212).

Nymphula fluctuosalis Zeller, 1852:27. Hampson, 1897:143.

Paraponyx fluctuosalis (Zeller) Hampson, 1891:40.

Paraponyx linealis Guenée, 1854:271. Meyrick, 1888:212.

Oligostigma curta Butler, 1879:270.

For detailed synonymy and bibliography, see Klima, 1937:81.

Kauai, Oahu, Maui.

Immigrant. A widespread moth known from Africa, India, Ceylon, China, Japan, Malaysia, Formosa, Guam, Australia and elsewhere. First recorded from Hawaii by Butler (1879:270) from examples taken by Blackburn.

Hostplants: Grasses growing in water, *Nymphaea*, rice.

The aquatic caterpillar forms a case of leaf fragments and lives about the bases of rice plants and other grasses and has occasionally been found on waterlily leaves. It has become a rice pest on occasion in Hawaii. Dr. Williams (1944:182, pl. 10) said that the moth "lays a number of flattish, rather elliptical yellowish eggs a little more than half a millimeter long. The young larva has a pair of long hairs on the dorsum of the terminal segment and there are also some sparse shorter hairs. Later on it acquires dorsally and laterally on the body, fine filamentous gills enclosing air tubes that join the longitudinal tracheal trunks. The

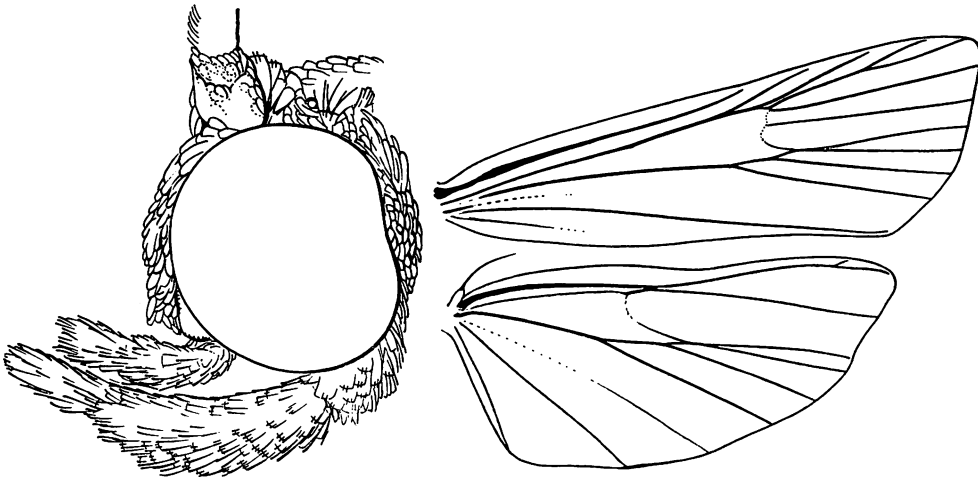


Figure 210—Head and wing venation of *Paraponyx fluctuosalis* (Zeller).

pupa is formed within a case or cocoon and is not extruded at the eclosion of the adult."

The leg-sheaths on the pupa extend distinctly beyond the apex of the abdomen.

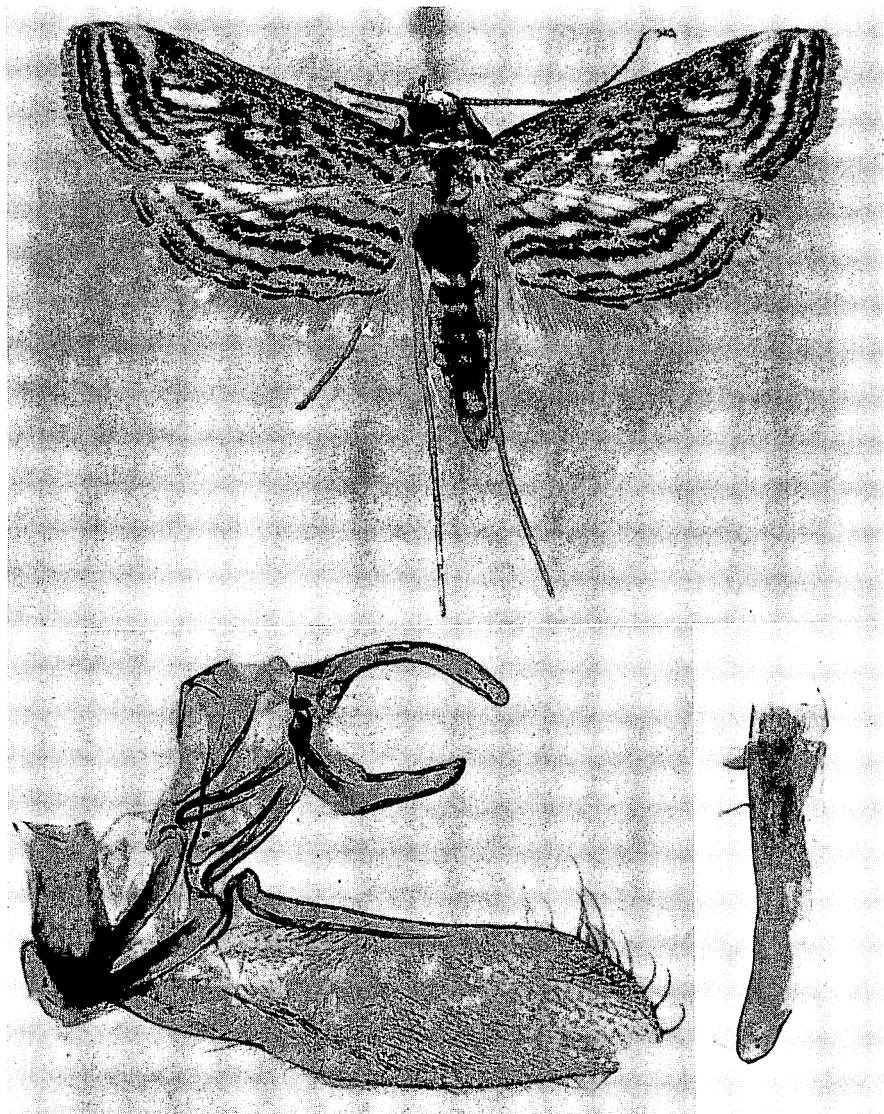


Figure 211—*Paraponyx fluctuosalis* (Zeller); Nuuanu, Oahu; bred from water lily; length of right fore wing, 7 mm. Below: Male genitalia. Lateral view with left valve removed and aedeagus at right.

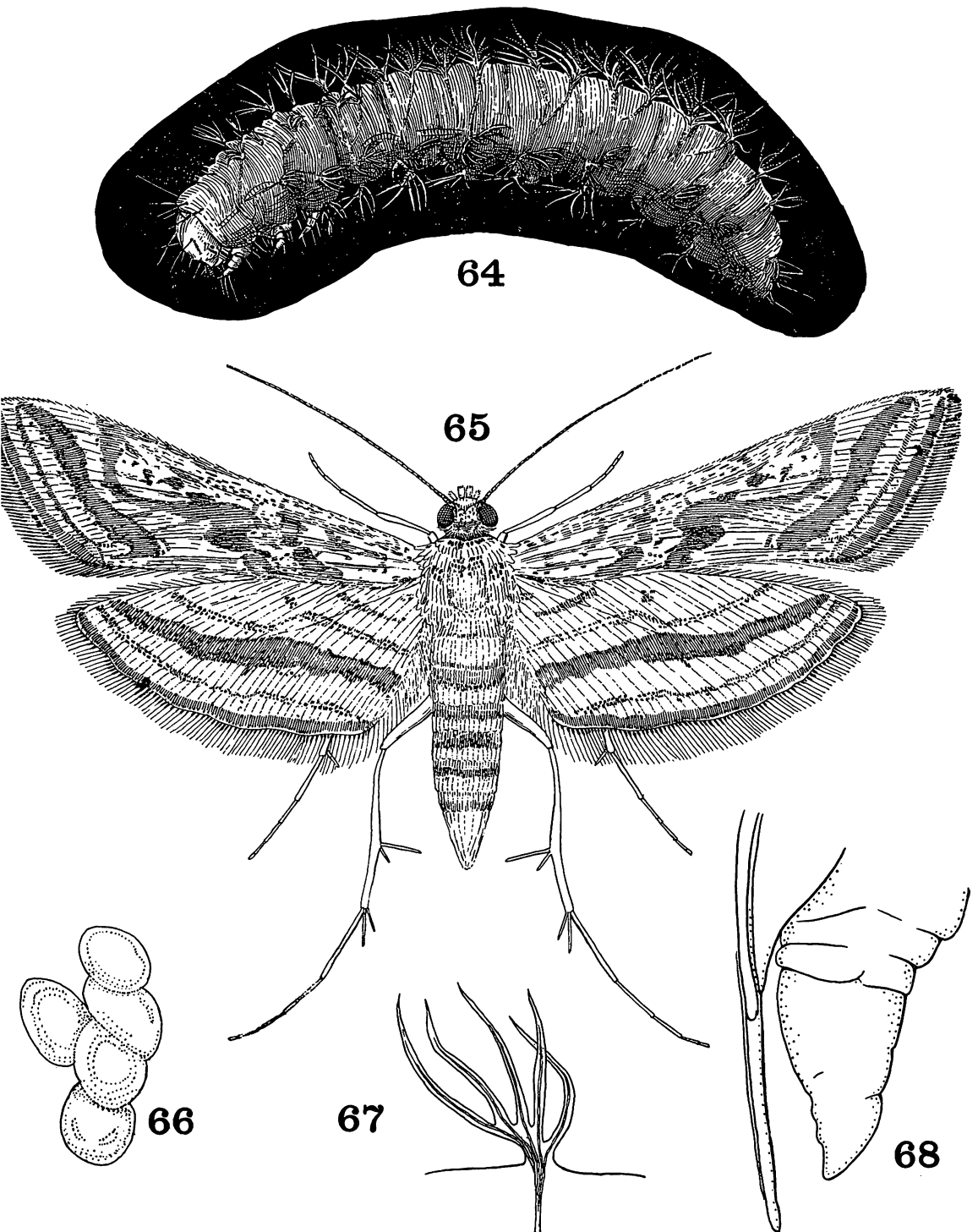


Figure 212—*Paraponyx fluctuosalis* (Zeller). 64, mature larva; 65, adult female, expanse, 17 mm.; 66, cluster of eggs; 67, a dorsolateral gill from a larva; 68, lateral view of caudal end of a dried pupa (note how different this is from the pupa of *Synchlita oblitteralis* (Walker)). (Plate from Williams, 1944.)

Genus **SYNCLITA** Lederer, 1863:448

Lange, 1956:104, redefinition, discussion.

Synclita oblitalis (Walker) (figs. 213, 214, 215).

Isopteryx ? oblitalis Walker, 1859:399.

Nymphula oblitalis (Walker) Hampson, 1897:141. Dyar, 1906:83, biology.

Forbes, 1910:219, larvae, pupae. Klima, 1937:90.

Hydrocampa oblitalis (Walker) Hart, 1896:176, figs. 8–12, eggs, larvae.

Synclita oblitalis (Walker) Lange, 1956:106, fig. 46.

Kauai, Oahu.

Immigrant. A North American species. First found in Hawaii by D. T. Fullaway, who discovered it in Honolulu in 1942.

Hostplant: *Nymphaea*, *Potamogeton* in America.

A group of eggs of this moth were found securely glued to the underside of a lily leaf close to the margin. They are low oval domes about 0.65 mm. long and of a whitish color. The larva at birth has a longitudinal tracheal system and some long simple hairs but does not later acquire filamentous gills. It does extensive though sporadic damage to lily leaves so that these become very ragged. It forms a case of pieces of leaf and wanders about as a case-bearer, inflicting its unsightly damage also upon the flowers of the lily. . . . The larva also uses the leaves of other aquatic plants for making cases. A large larva 9 mm. long has a pale brown head, a darker narrowly fissate prothoracic shield and a dull pallid green body. The antennae are conspicuously porrect and there are sparse erect hairs on head and body. When under water the extruded fore part of the body dorsally, from the second segment, is beautifully silvered. The cocoon case is blunter at the fore end, and in issuing from it the moth makes a wide slit in the silk. In the laboratory the cocoon was securely fastened to the side of the glass container, just above the water line. The pupa has the spiracles on segments 2–4 of the abdomen large and protruding. (Williams, 1944:184, pl. 11.)

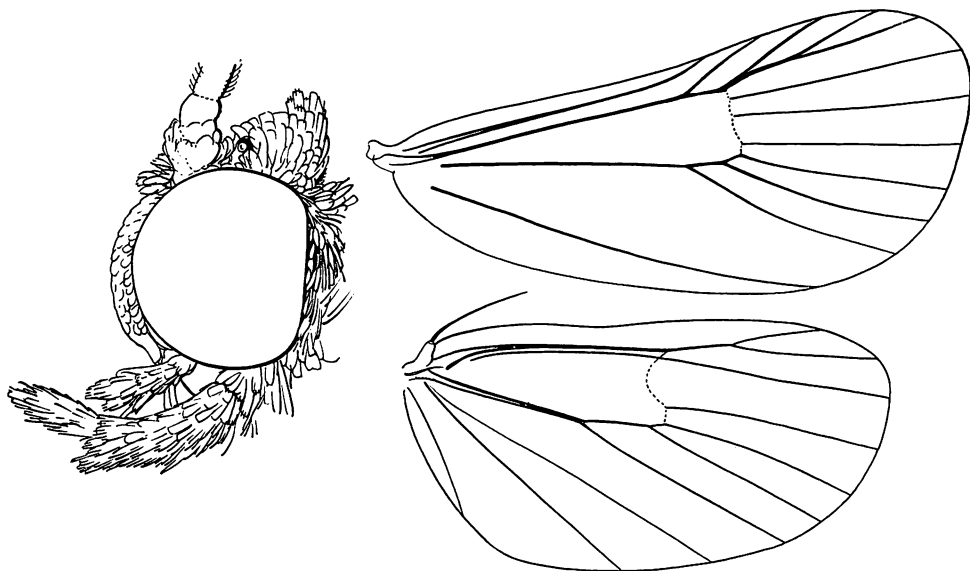


Figure 213—Head and wing venation of *Synclita oblitalis* (Walker).

The leg-sheaths on the pupa do not reach the apex of the abdomen.
See Hart (1896) for an illustrated account of the biology of this species.

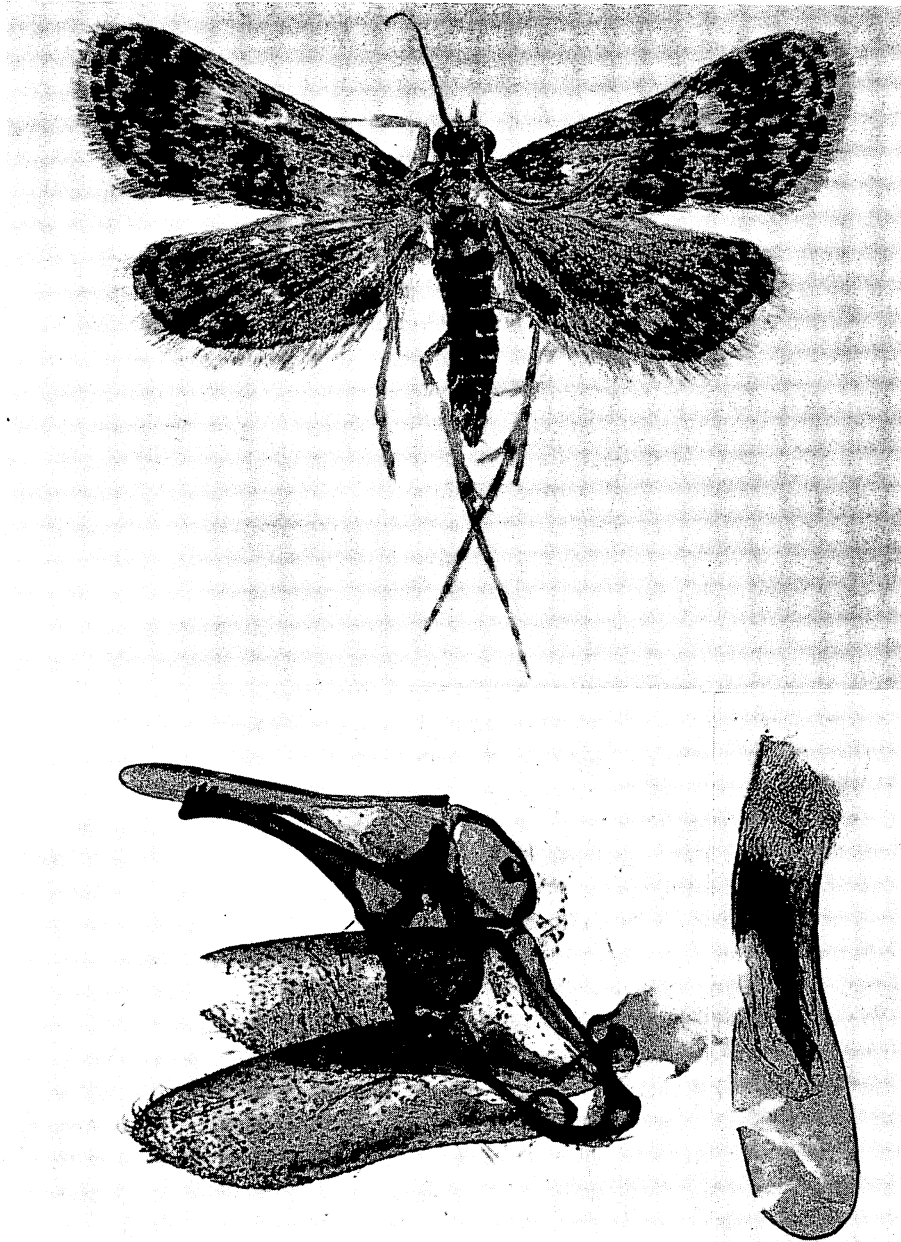


Figure 214—*Synclita oblitalis* (Walker); Honolulu; bred from *Nymphaea*; length of right fore wing, 5 mm. Below: Lateral view of male genitalia and aedeagus; Texas.

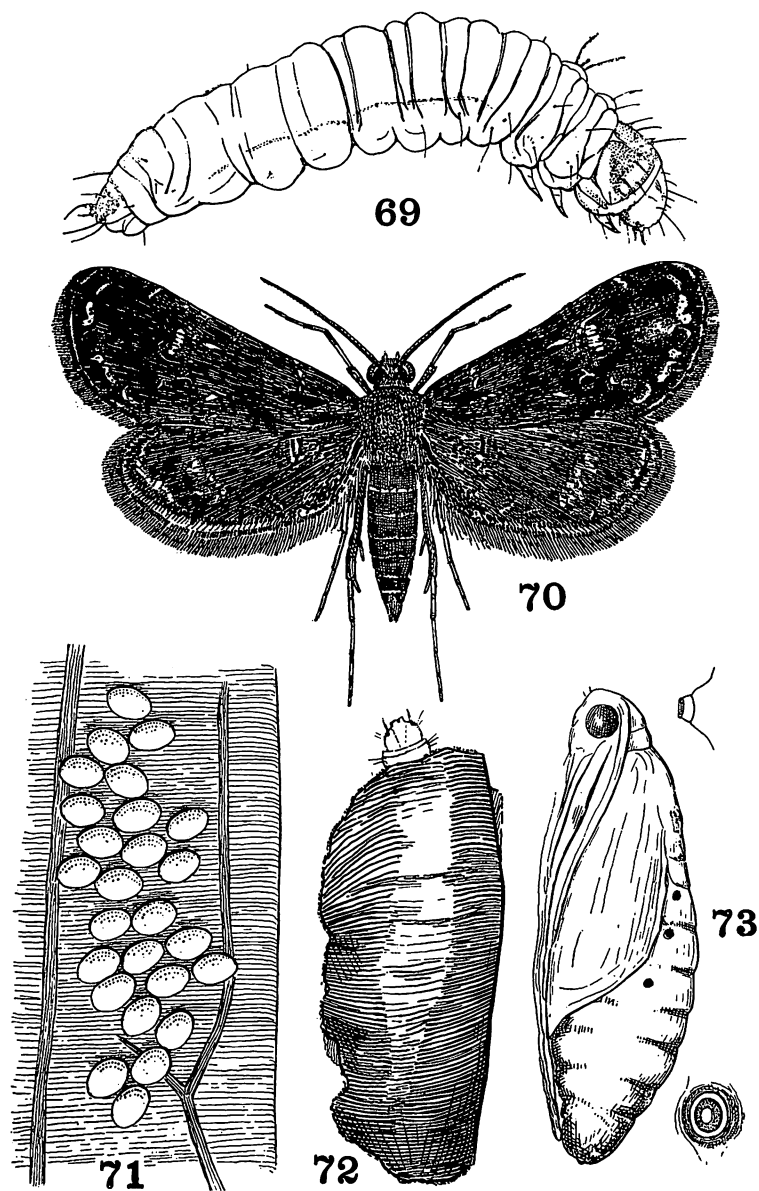


Figure 215—*Synclita oblitalis* (Walker). 69, mature larva; 70, adult, expanse, 11.5 mm.; 71, cluster of eggs near the margin of the under side of a *Nymphaea* leaf (eggs 0.65 mm. long); 72, case containing larva, made of small pieces of *Nymphaea* leaf; 73, pupa, 5.2 mm. long, with two views of the second visible spiracle. (Plate from Williams, 1944.)

Subfamily PYRALINAE

There are no endemic members of this subfamily in Hawaii. The ocelli are wanting, but the chaetosemae are present.

KEY TO THE GENERA OF PYRALINAE FOUND IN HAWAII

1. Fore wing with vein 8 arising from 9; in hind wing, vein 2 leaves cell opposite a point basad of origin of vein 7. . **Pyralis.**
2. Fore wing with vein 8 arising from 7; in hind wing, vein 2 leaves cell opposite to a point distad of origin of vein 7. .
..... **Hypsopygia.**

Genus **PYRALIS** Denis and Schiffermueller, 1775:118

Pyralis manihotalis Guenée (figs. 216, 217, 218).

Pyralis manihotalis Guenée, 1854:121. Meyrick, 1899:275.

Pyralis achatina Butler, 1877:49 (type probably from Honolulu).

Asopia gerontesalis Walker, 1859:896.

Asopia gerontialis, misspelling by Meyrick, 1888:212.

Corbet and Tams, 1943:64, figs. 45, 103, 140, and synonymy.

Oahu.

Immigrant. A widespread species known from Africa, India, Ceylon, China, Formosa, Malaysia, Philippines, Australia, Samoa, South America and the West Indies.

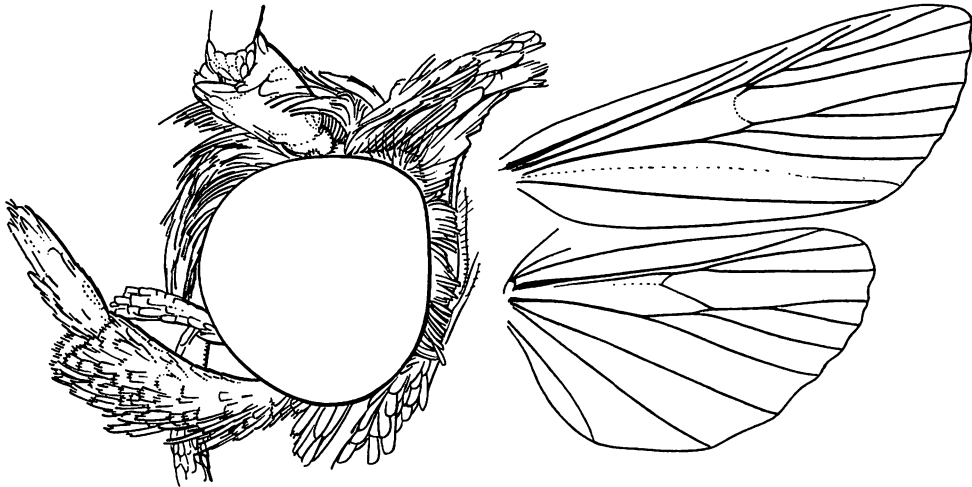


Figure 216—Head and wing venation of *Pyralis manihotalis* Guenée.

Host: In Samoa, it has been bred from refuse in chicken houses, but I have no notes on its habits in Hawaii. Corbet and Tams (1943:64) record it from "stored grain, meal, pulses, dried fruit, chocolate, etc."

Only a few specimens of this species have been collected in Hawaii. It was first found here by Blackburn (Butler, 1877:49), and Perkins (1913:162) reported it "common in many houses in Honolulu" (it is strange, however, that only one example is recorded in Meyrick's report in *Fauna Hawaiiensis*); only a few specimens have been collected in the last 50 years. Corbet and Tams (1943:168) have commented upon the relationships of this and the closely associated *pictalis* (Curtis).

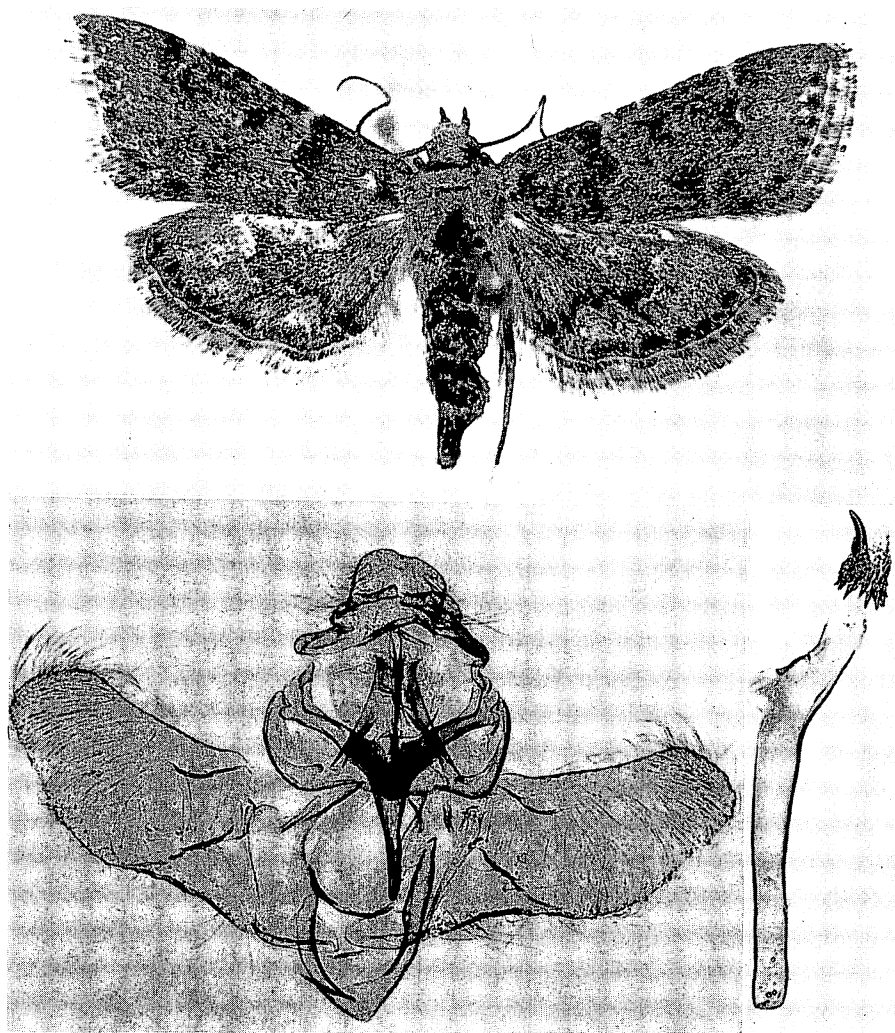


Figure 217—*Pyralis manihotalis* Guenée; Honolulu; right fore wing 10 mm. long. Male genitalia from an Australian specimen.



Figure 218—Female genitalia of *Pyralis manihotalis* Guenée; Honolulu.

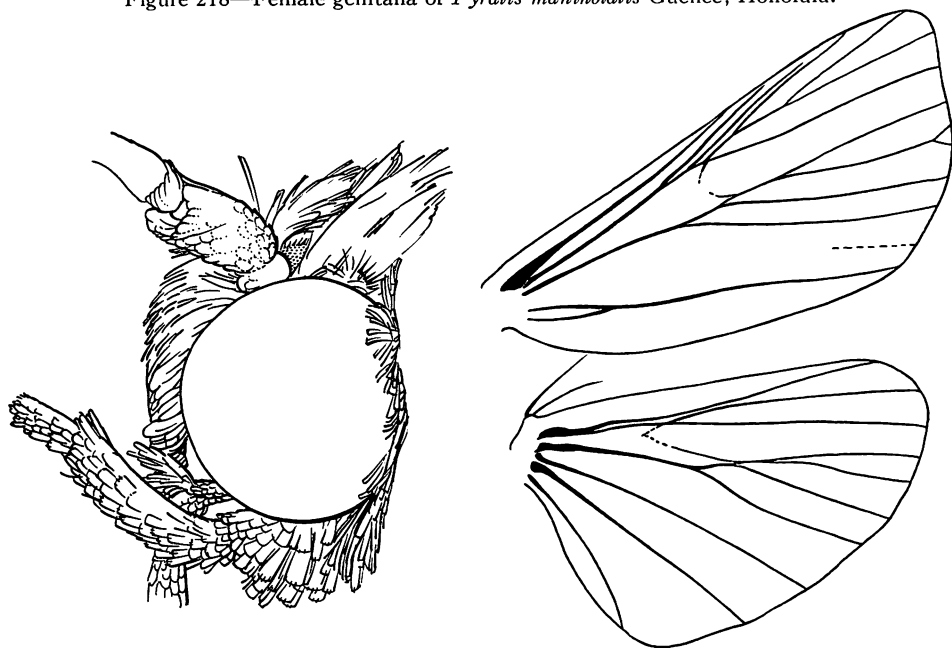


Figure 219—Head and wing venation of *Hypsopygia mauritialis* (Boisduval).

Genus **HYPSOPYGIA** Huebner

Hypsopygia Huebner, 1825:348. Type: *Pyrallis fimbrialis* Denis and Schiffermueller, 1775:124 (*Phalaena costalis* Fabricius, 1775:644), cited by Westwood, 1840:105, and Hampson, 1896:148.

Hypsopygia mauritialis (Boisduval) (figs. 48, 219, 220).

Asopia mauritialis Boisduval, 1833:119, pl. 16, fig. 8. Meyrick, 1899:275; 1904:356. Perkins, 1913:162.

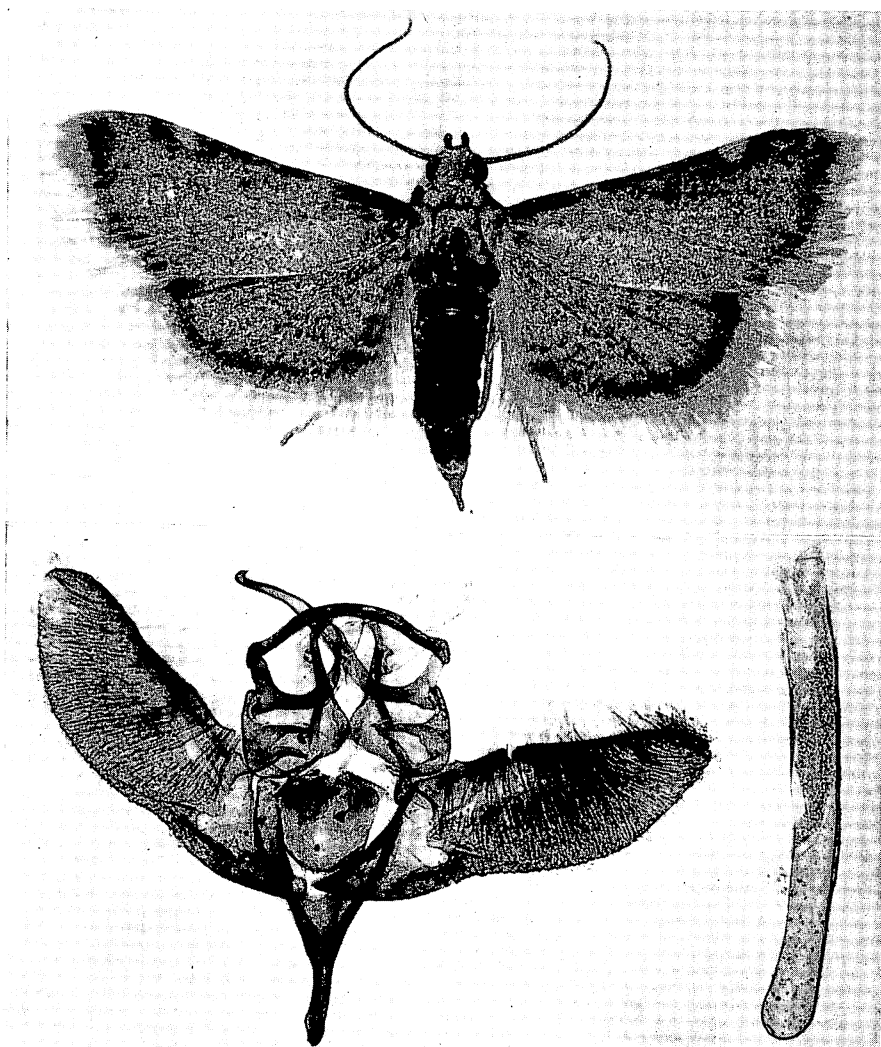


Figure 220—*Hypsopygia mauritialis* (Boisduval), female; Koloa, Kauai; right fore wing 9 mm. long. Male genitalia from a Kauai example.

Pyrallis Lucillalis Walker, 1859:268.

Pyrallis regalis Walker, 1865:1241.

Pyrallis ducalis Walker, 1865:1242.

Hypsopygia laticiliialis Ragonot, 1891:28.

Hypsopygia maritialis (Boisduval) Hampson, 1896:148; 1896:507, figs.

Paraglossa mauritialis (Boisduval), of authors.

Kauai, Niihau, Oahu.

Immigrant. A widespread species known from Africa, India, China, Malaysia, Formosa, Japan and Australia. First recorded from Hawaii by Meyrick (1899: 275) from specimens taken on Kauai by Perkins and G. C. Munro.

Host: The caterpillars feed in the old nests of *Polistes* wasps.

Parasite: *Stomatoceras pertorvum* Girault.

The generic name *Paraglossa* appears to have come into use for this species because Hampson changed his mind about what he considered the type of the genus. Although he had listed *costalis* (Fabricius) as the type in 1896 (in his volume in *Fauna of British India*), he later decided to ignore the citation, and in the British Museum collection he placed *mauritialis* in *Paraglossa*. Subsequently, the combination *Paraglossa mauritialis* was used when determinations were made from the collection.

Subfamily CRAMBINAE

Crambidae Ragonot, 1890:445.

Crambinae Ragonot, 1890:445.

Fernald, 1896. Hampson, 1895.

The character frequently used in defining this subfamily is the presence of a pecten of hairs along at least the basal part of the medial vein on the upper side of the hind wings. The pecten is obsolete on the endemic genera *Mestolobes* and *Promylaea*, and this has caused considerable confusion in previous publications. Ocelli and chaetosemae are present. The tarsal claws are not toothed on any of the genera included here.

The notorious and dreaded *Diatraea* stalk borers of sugarcane belong to this subfamily. The introduction of *Diatraea* to Hawaii might be disastrous to the sugar industry and the economy of the Islands.

KEY TO THE GENERA OF CRAMBINAE FOUND IN HAWAII

1. Hind wing with seven veins and without a pecten of hairs along the upper side of the medial vein (the vein along the posterior side of the cell).....2
- Hind wing with seven or eight veins and with a pecten of hair along the basal part of the medial vein on the uppersurface.....3

- 2(1). Hind wing with veins 4 and 5 fused basad and forking at a distance from point of origin, thus vein 4 arises from 5 far beyond apex of cell..... **Mestolobes.**
 Hind wing with veins 4 and 5 diverging from origin, thus vein 4 arises from base of 5 at apex of cell.....
 **Mestolobes** subgenus **Promylaea.**
- 3(1). Fore wing with termen peculiarly notched at end of vein 4; only nine veins present..... **Tulla.**
 Termen of fore wing not notched, twelve veins present..... 4
- 4(3). Hind wing with only seven veins; vein 3 absent.....
 **Orthomecyna.**
 Hind wing with all eight veins present; vein 3 well developed..... 5
- 5(4). Hind wing with vein 5 very short, only about as long as breadth of cell in our species..... **Euchromius.**
 Hind wing with vein 5 normal, more than twice as long as breadth of cell..... 6
- 6(5). Frontal prominence of head produced into a sharp point..... **Chilo.**
 Frontal prominence of head smoothly convex.... **Tamsica.**

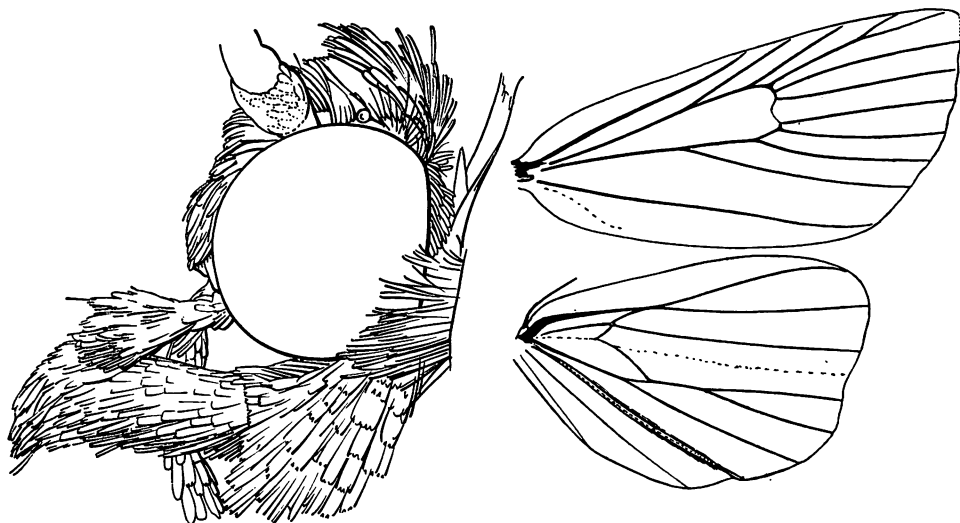


Figure 221—Head and wing venation of *Orthomecyna exigua* (Butler). Note the pocket-like fold in the hind wing (male).

Genus **ORTHOMECYNA** Butler, 1883:178. Meyrick, 1888:226.

When I first began my study of this endemic group, I thought that it would be relatively simple to work out the fourteen forms, but I soon found it to be an almost impossible task with the material available. I must confess that I am utterly confused by these organisms. I do not know what is a species, subspecies or variety. They seem to be in an active state of flux. Even a detailed study of

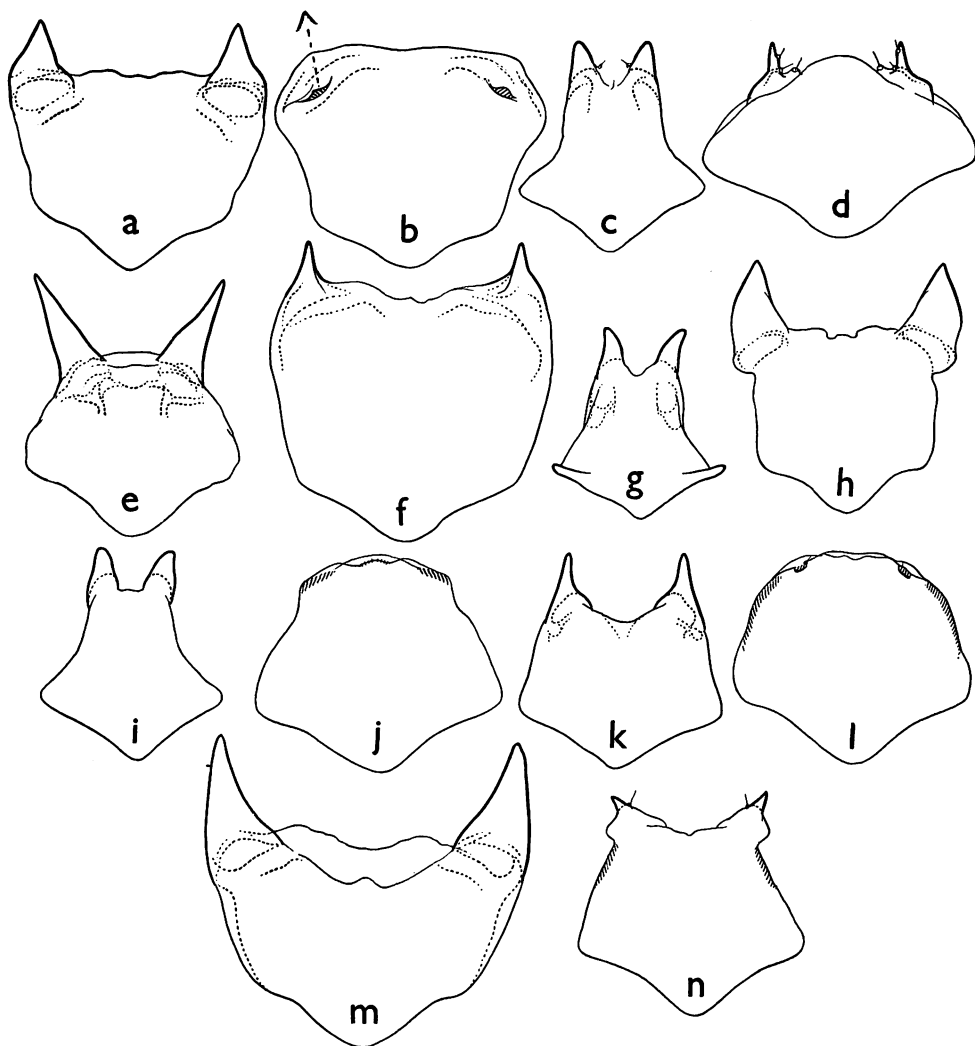


Figure 222—*Orthomecyna*, the juxta of the male genitalia: **a**, *albicaudata* Butler, type; **b**, *allop-tila* Meyrick, type (the tooth-like protuberance is seen end on from above, it is really triangular and upturned); **c**, *aphanopis* Meyrick, type; **d**, *amphilyca* Meyrick, type; **e**, *chrysophanes* Meyrick; **f**, *crossias* Meyrick, type; **g**, *exigua cupreipennis* Butler, type; **h**, *epicausta* Meyrick, type; **i**, *exigua exigua* (Butler), type; **j**, *heterodryas* Meyrick, type; **k**, *mesochasma* Meyrick, type; **l**, *meta-lycia* Meyrick, type; **m**, *phaeophanes* Meyrick, type; **n**, *picrodes* Meyrick, type.

the genitalia has not thrown much light on the problem; in fact, some of the dissections have added to my confusion, because some species which appear distinct have rather similar genitalia, and others which one would expect to be closely similar have greater genitalic differences. I have found from examination of the genitalia that some of Meyrick's type series represent more than one species. There are, for example, six specimens in Meyrick's type series of *phaeo-*

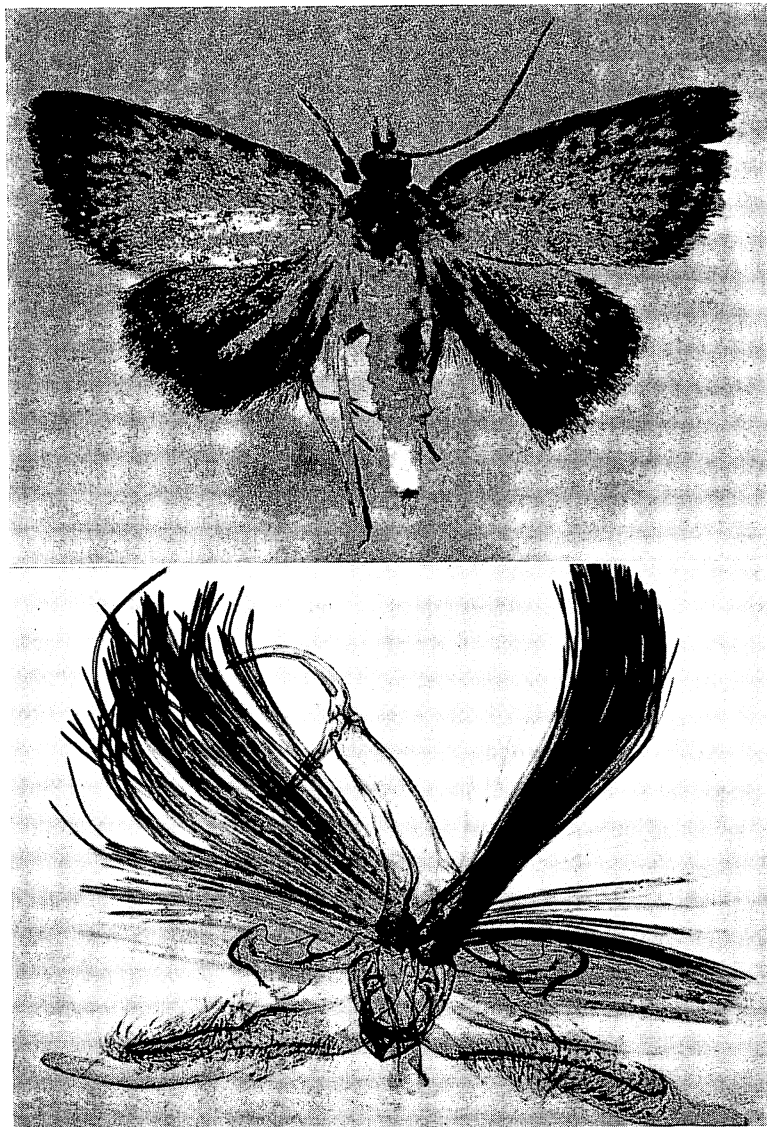


Figure 223—*Orthomecyna albicaudata* Butler; "Hawaiian Isl. 82-98" (Blackburn); expanse, 19.5 mm. Below: The male genitalia of the type; a Blackburn example; no field data.

phanes in the British Museum, four males and two females. It appears that *six species* are represented by these six examples!

In *Fauna Hawaiiensis*, Meyrick gave a key to the fourteen species recognized by him. I find that key worthless. The making of a key to this group is very difficult because of variation (or apparent variation). Even slight variation of some of the color and pattern is enough to make useless a character which appears at first sight to be good. Under present circumstances, I am unable to present a key. It should be possible to identify most species by comparisons with my photographs of the types and the dissections of the genitalia, and with reference to the original descriptions when necessary (but the original descriptions must be used

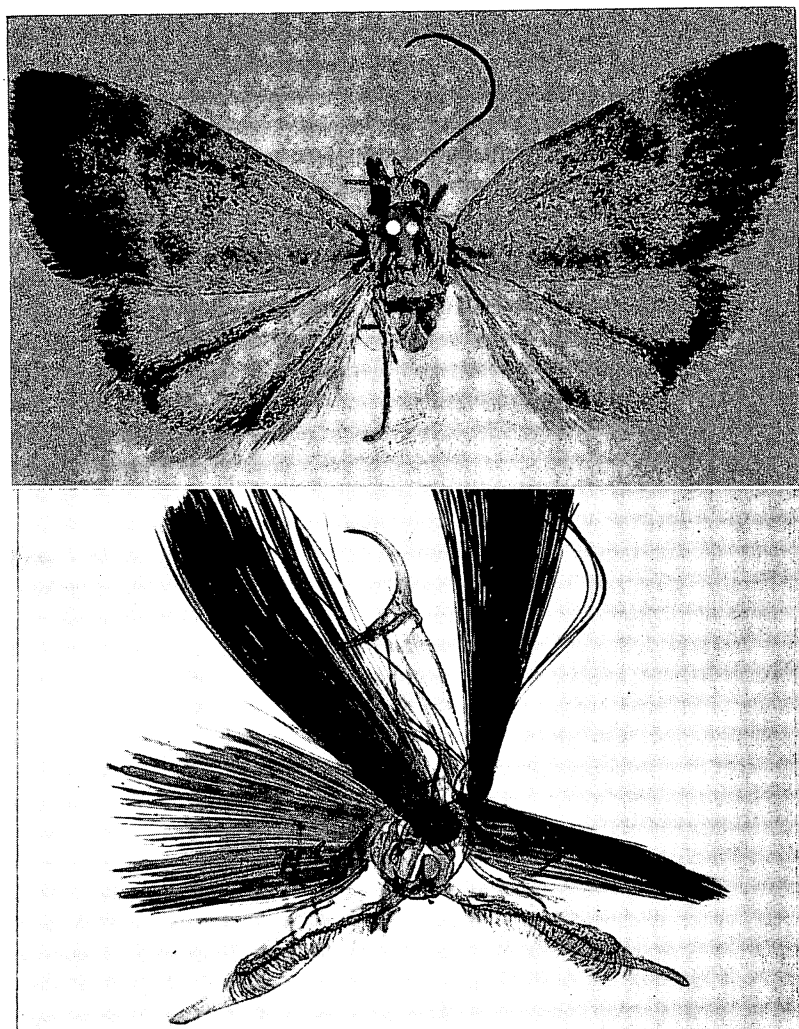


Figure 224—*Orthomecyna alloptila* Meyrick, the male type and its genitalia; Kilauea, Hawaii; expanse, 20 mm.

with caution). When adequate material (preferably reared) is assembled and a careful study made of distribution and variation within the group, then some worker in future may be able to clarify this problem. Certainly the situation warrants careful study. Many of the species are beautiful insects, and the many problems associated with them are both challenging and most interesting.

Hampson placed *Orthomecyna* between *Euchromius* (*Ommatopteryx*) and *Eudorina* in the British Museum collection. I have examined the genitalia of some species of *Euchromius* and the male genitalia of *Eudorina diffusa* (Hampson), and neither of these genera shows any relationship to *Orthomecyna*. *Orthomecyna* ap-

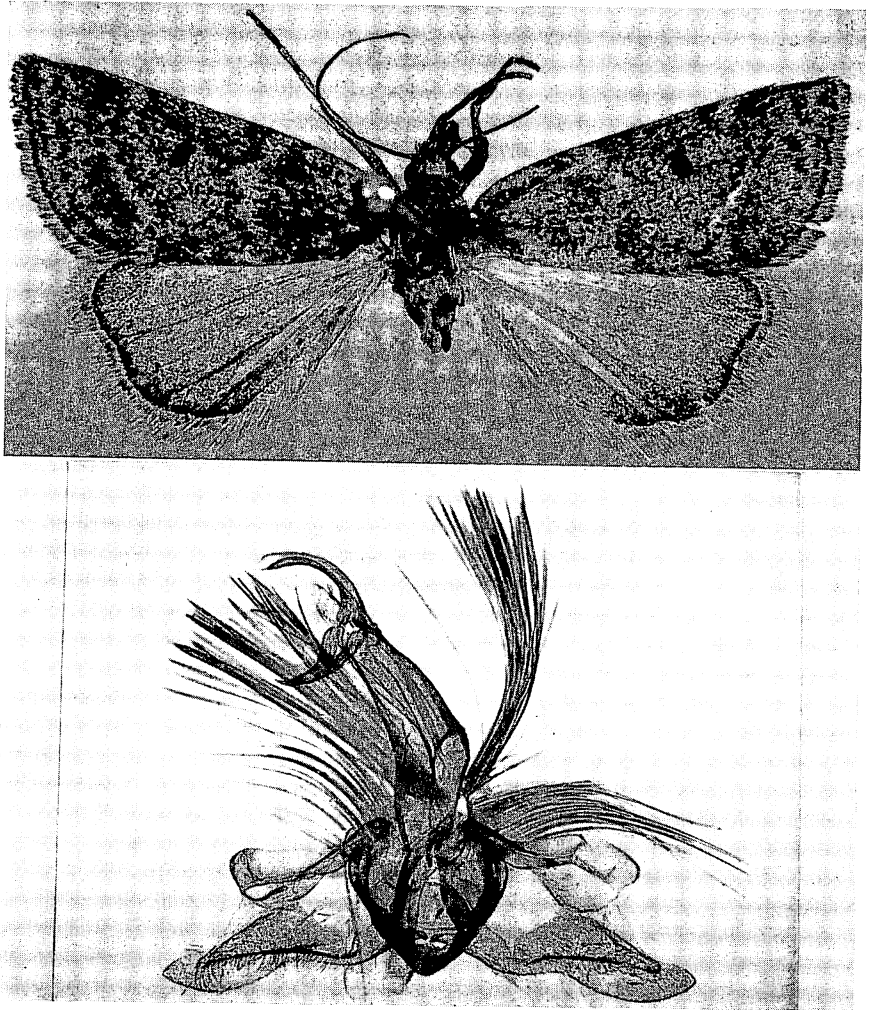


Figure 225—*Orthomecyna amphilyca* Meyrick, the male type and its genitalia; Haleakala, Maui, 9,000 feet; expanse, 21.5 mm. The genitalia are rather similar to those of *picrodes*, but the juxta is different.

pears to be one of the more distinctive endemic Hawaiian genera. I do not know of any genus outside of Hawaii to which it may be allied. (See *Mestolobes* for further comments.)

It is of interest to note that not one new species has been described in this genus since 1899.

Dr. Swezey found one larva of *Orthomecyna* about the roots of a stool of sugarcane, but that is the only record we have of the caterpillars or habits of the species of this genus (see *mesochasma*).

In general the habits of *Orthomecyna* are like those of *Mestolobes*, but in a number of species there is a tendency to fly low and settle on the ground or near it. These low-flying species are

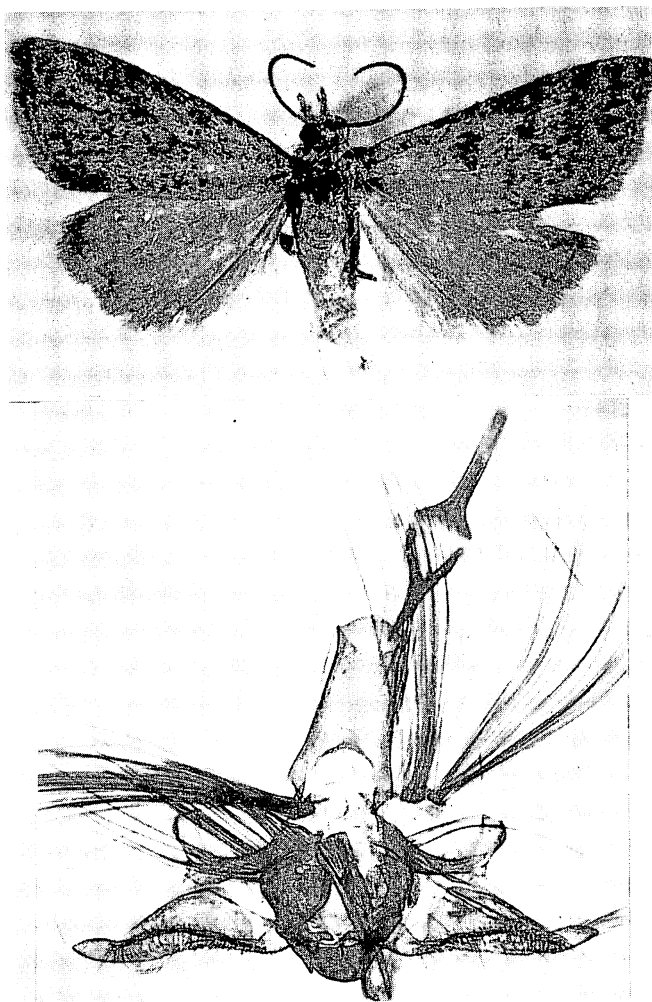


Figure 226—*Orthomecyna aphanopis* Meyrick; "Hawaiian Is. T.B./81" (Blackburn); expanse, 16 mm. Below: Male genitalia of the lectotype; a Blackburn example from the Meyrick collection; no field data.

generally of obscure coloration, compared with the more arboreal forms. Some visit flowers of forest trees and some come freely to light. *O. epicausta*, *exigua* and *mesochasma* are excessively numerous in certain localities at proper seasons. Some of these, like some of the *Mestolobes*, can be dislodged in extraordinary numbers from bushy trees, in which they are resting during the daytime. Nearly all the species are true forest insects, though they are sometimes found in the open country below or above the forest-belt. None seem to occur in the lowlands, at least not on the leeward side of the islands. Considered generally they do not seem to show any particular liking for the excessively wet parts of the forests, which are frequented by many species of *Mestolobes*. Like the latter, some are extremely variable in markings. (Perkins, 1913:161.)

I have never found any *Orthomecyna* or *Mestolobes* in such numbers as described by Perkins. Perhaps foreign parasites and diseases have considerably reduced the numbers of these moths.

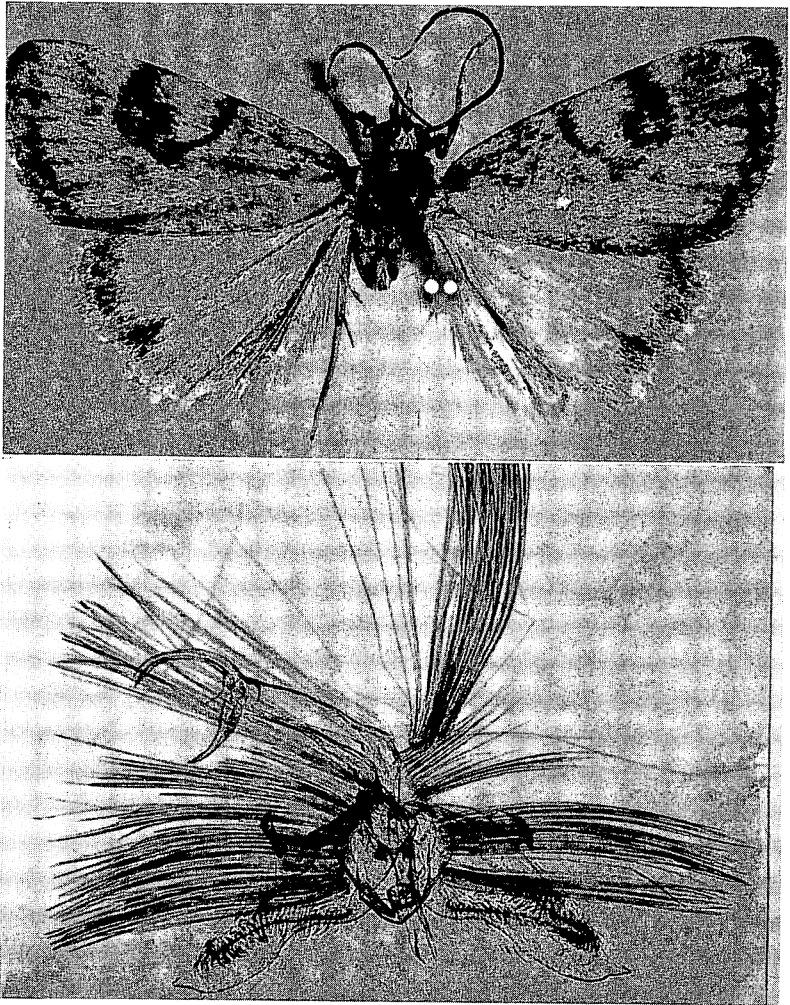


Figure 227—*Orthomecyna chrysophanes* Meyrick, the male type and its genitalia; Waimea Mts., Kauai, 4,000 feet; expanse, 20 mm.

I am not satisfied that the sexes of all of the species have been correctly matched in collections. I have examined the genitalia of the males and the supposed females of all species with the exception of the females of *amphilyca*, *crossias*, *cupreipennis* and *metalycia*.

Orthomecyna albicaudata Butler (figs. 222, 223, 237).

Orthomecyna albicaudata Butler, 1883:178.

Endemic. Lanai (type locality: about 2,000 feet).

Hostplant: Unknown.

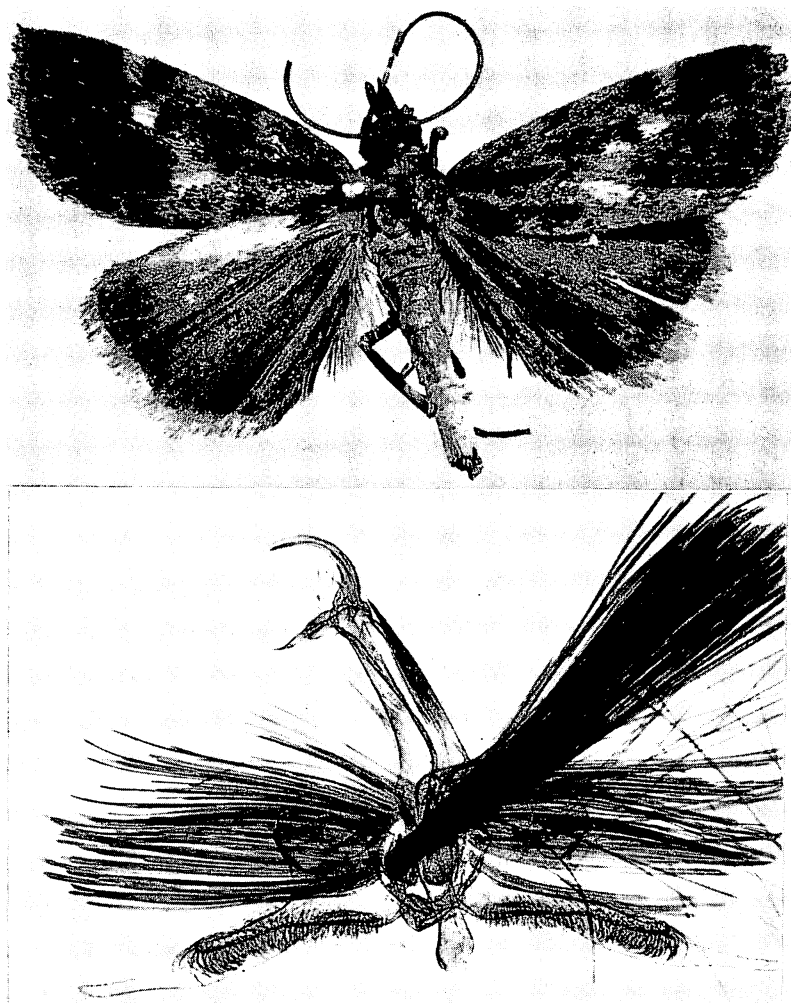


Figure 228—*Orthomecyna crossias* Meyrick, the male type and its genitalia; Oahu, 2,000 feet; expanse, 22.5 mm.

Orthomecyna alloptila Meyrick (figs. 222, 224).*Orthomecyna alloptila* Meyrick, 1899:243.

Endemic. Hawaii (type locality: Kilauea).

Hostplant: Unknown.

Orthomecyna amphilyca Meyrick (figs. 222, 225).*Orthomecyna amphilyca* Meyrick, 1899:245.

Endemic. Maui (type locality: Haleakala, 4,000 feet).

Hostplant: Unknown.

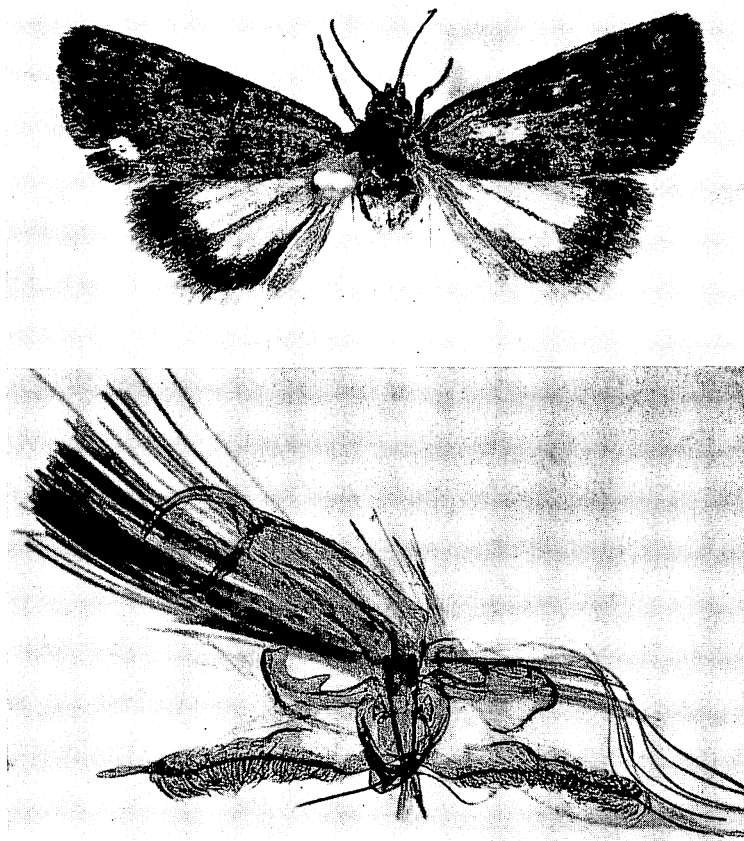
Orthomecyna aphanopis Meyrick (figs. 222, 226, 237).*Orthomecyna aphanopis* Meyrick, 1888:227; 1899:244.

Figure 229—*Orthomecyna epicausta* Meyrick, the male type and its genitalia; Kona, Hawaii, 5,000 feet; expanse, 17 mm.

Endemic. Oahu ? (type locality not known).

Hostplant: Unknown.

This is the smallest species of the genus. Although some examples of some species, such as *epicausta*, may be as small, their average sizes are larger.

The type series of three examples is in the Meyrick collection, and the specimens have been attacked by mold. They are labeled simply: "Hawaiian Is. T.B./81." Meyrick thought that they came either from Maui or Oahu. I feel that the best guess for the locality is Oahu. The genitalia are so much like *exigua* that it may be only a subspecies of *exigua*. No type was labeled by Meyrick, and I have designated a lectotype in the British Museum. Perkins did not collect this species, and I have no other records.

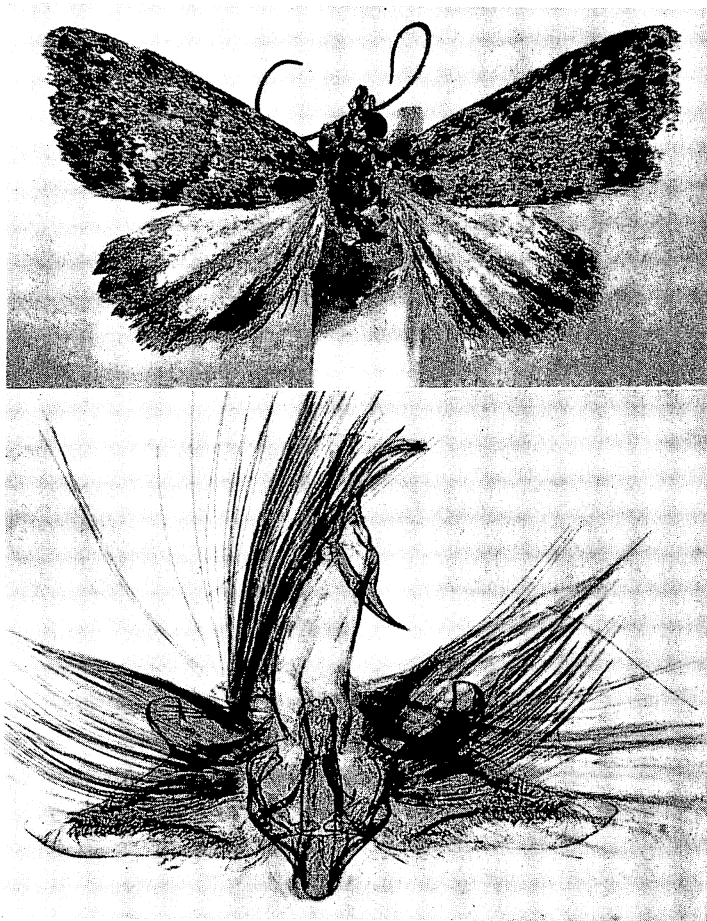


Figure 230—*Orthomecyna exigua exigua* (Butler), the male type and its genitalia; "Sandw. I. 79-8 No. 62" (Blackburn); expanse 16.5 mm.

Orthomecyna chrysophanes Meyrick (figs. 222, 227, 237).

Orthomecyna chrysophanes Meyrick, 1899:243, pl. 6, fig. 24.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

This is an extremely variable species.

Orthomecyna crossias Meyrick (figs. 222, 228).

Orthomecyna crossias Meyrick, 1899:242.

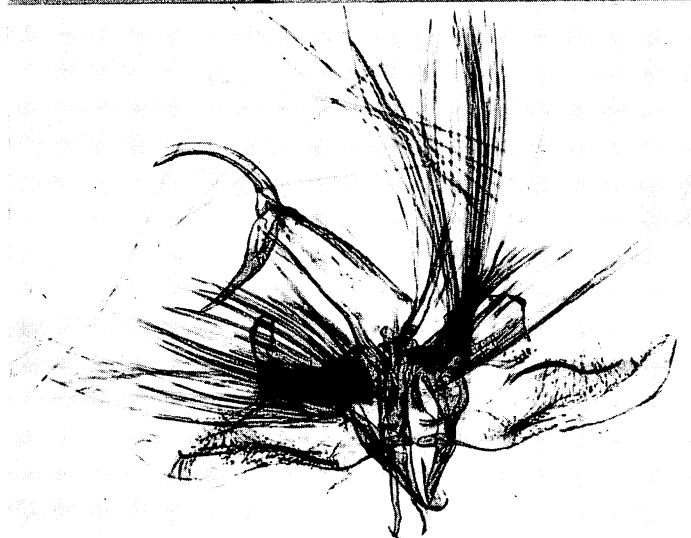
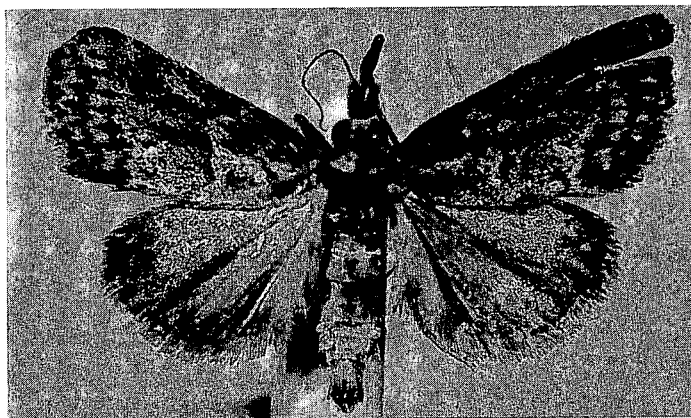


Figure 231—*Orthomecyna exigua cupreipennis* Butler, the male type and its genitalia, "Hawaiian Isl. 82-98" and the Blackburn code sign for Lanai; expanse, 17 mm., wings strongly bent ventrad. Because of the position in the balsam mount, the genitalia appear more different from those illustrated for *exigua exigua* than is true.

Endemic. Oahu (type locality: 2,000 feet).
Hostplant: Unknown.

Orthomecyna epicausta Meyrick (figs. 222, 229, 237).
Orthomecyna epicausta Meyrick, 1899:244, pl. 6, fig. 25.

Endemic. Hawaii (type locality: Kona, 5,000 feet).
Hostplant: Unknown.

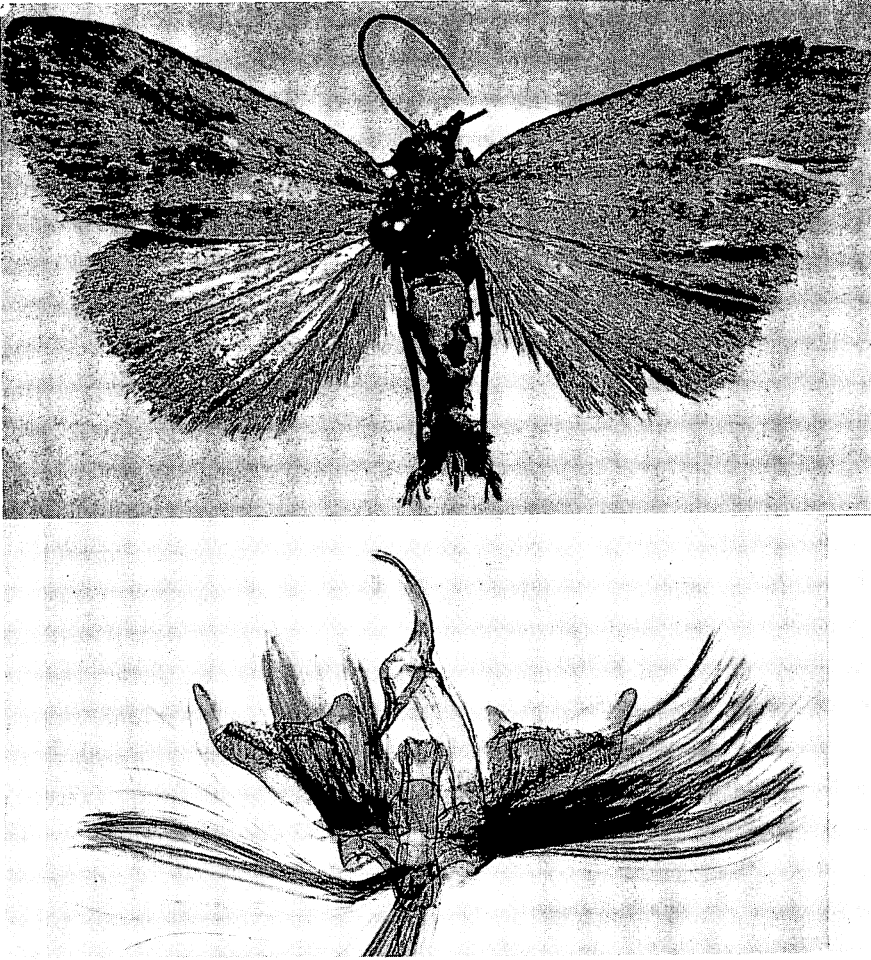


Figure 232—*Orthomecyna heterodryas* Meyrick, the male type and its genitalia; Kilauea, Hawaii; expanse, 25 mm.

Orthomecyna exigua exigua (Butler) (figs. 221, 222, 230, 237). Type of *Orthomecyna*.

Mecyna exigua Butler, 1879:271; 1881:329.

Orthomecyna exigua (Butler) Butler, 1883:178. Meyrick, 1888:227; 1899:245.

Endemic. Molokai, Maui, Lanai (type locality: not more precisely known; the type was said to have come from Maui, but it bears the Blackburn code sign for Lanai), Hawaii.

Hostplant: Unknown.

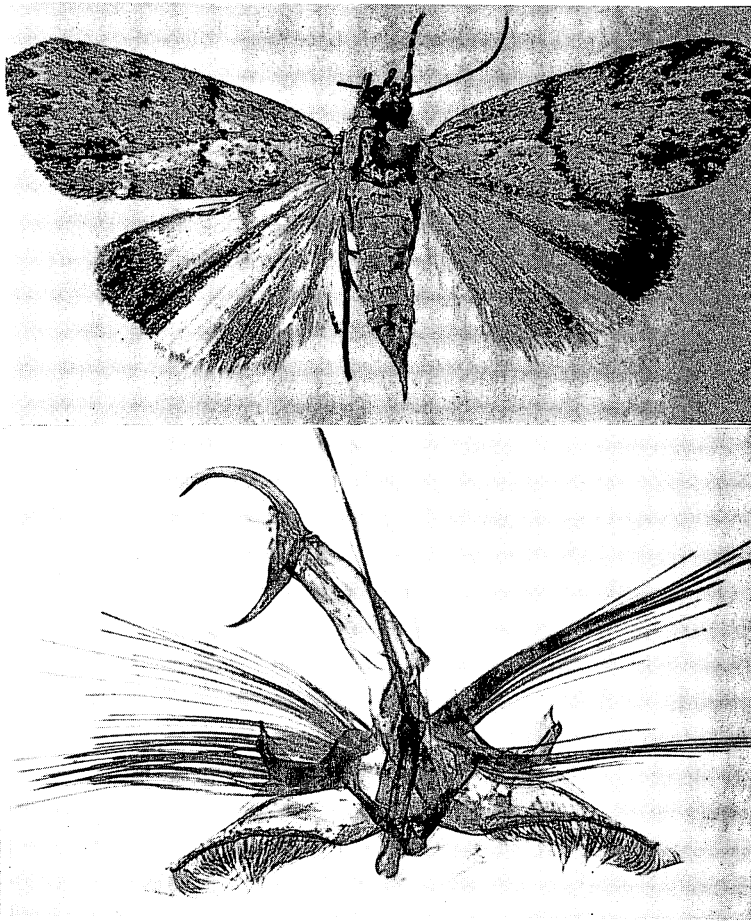


Figure 233—*Orthomecyna mesochasma* Meyrick, the female type; Waimea Mts., Kauai, 3,000–4,000 feet; expanse, 20 mm. Male genitalia of an example closely similar to the female type; Kaholuamano, Kauai, 4,000 feet.

***Orthomecyna exigua cupreipennis* Butler (figs. 222, 231).**

Orthomecyna exigua variety *cupreipennis* Butler, 1883:179.

Orthomecyna cupreipennis (Butler) Meyrick, 1899:245.

Endemic. Lanai (type locality: not further determined).

Hostplant: Unknown.

I consider this to be only a subspecies of *exigua*. In Meyrick's personal collection,

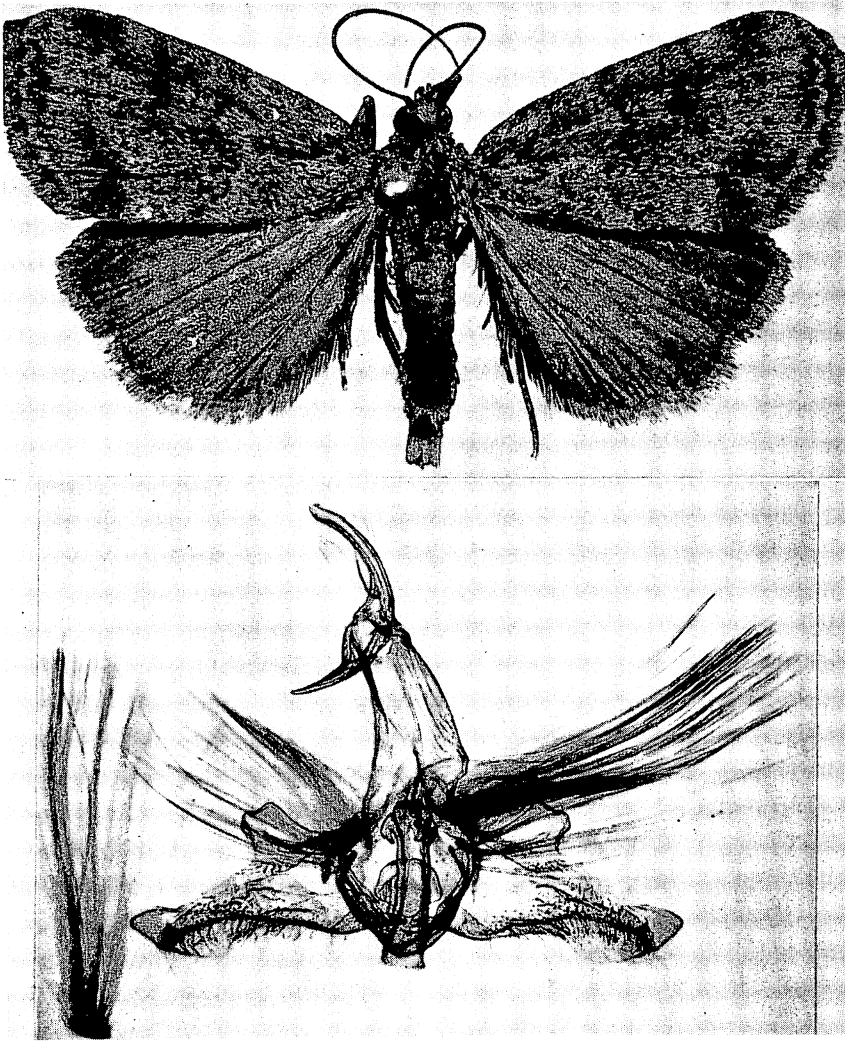


Figure 234—*Orthomecyna metalycia* Meyrick, the male type and its genitalia; Kona, Hawaii, 4,000 feet; expanse, 25 mm.

he placed all fourteen examples in his possession under *exigua*, and the name *cupreipennis* does not appear in his box. I have noticed a slight difference in the male genitalia between this form and typical *exigua*. There are eleven examples in the British Museum collection, and it appears to me that more than one form is included.

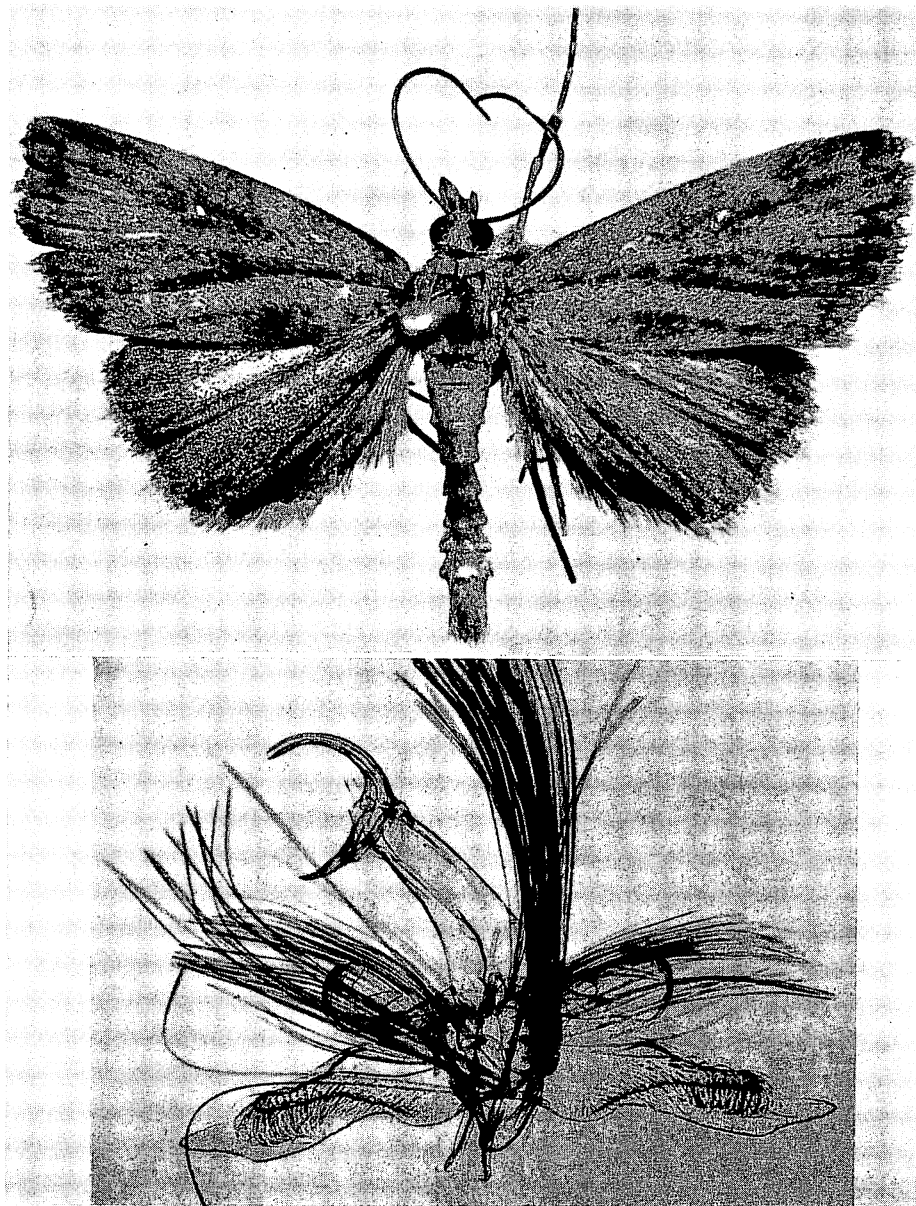


Figure 235—*Orithomecyna phaeophanes* Meyrick, the male type and its genitalia; Molokai Mts., over 3,000 feet; expanse, 22 mm.

***Orthomecyna heterodryas* Meyrick (figs. 222, 232, 237).**

Orthomecyna heterodryas Meyrick, 1899:242, pl. 6, fig. 23.

Endemic. Hawaii (type locality: Kilauea).

Hostplant: Unknown.

***Orthomecyna mesochasma* Meyrick (figs. 222, 233, 237).**

Orthomecyna mesochasma Meyrick, 1899:244, pl. 7, fig. 1.

Endemic. Kauai (type locality: Waimea Mountains, 3,000 to 4,000 feet).

Hostplant: In 1923, Dr. Swezey reared an example of this species from a whitish

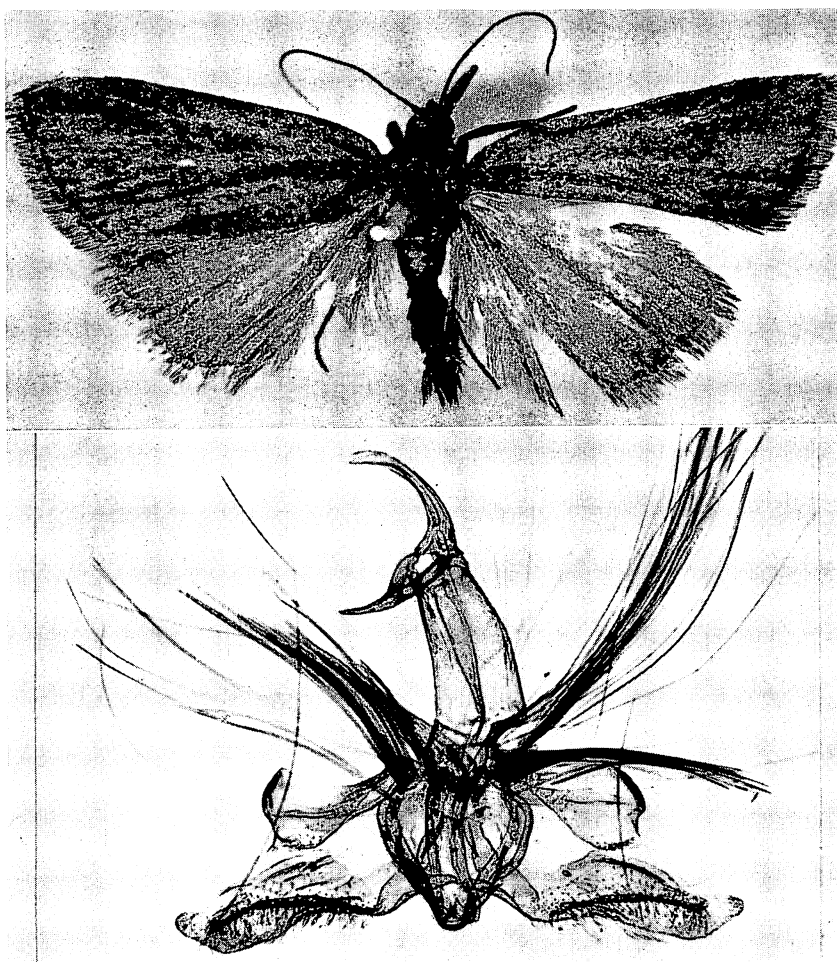


Figure 236—*Orthomecyna picroides* Meyrick, the male type and its genitalia; Hualalai, Hawaii, 8,000 feet; expanse, 21 mm.

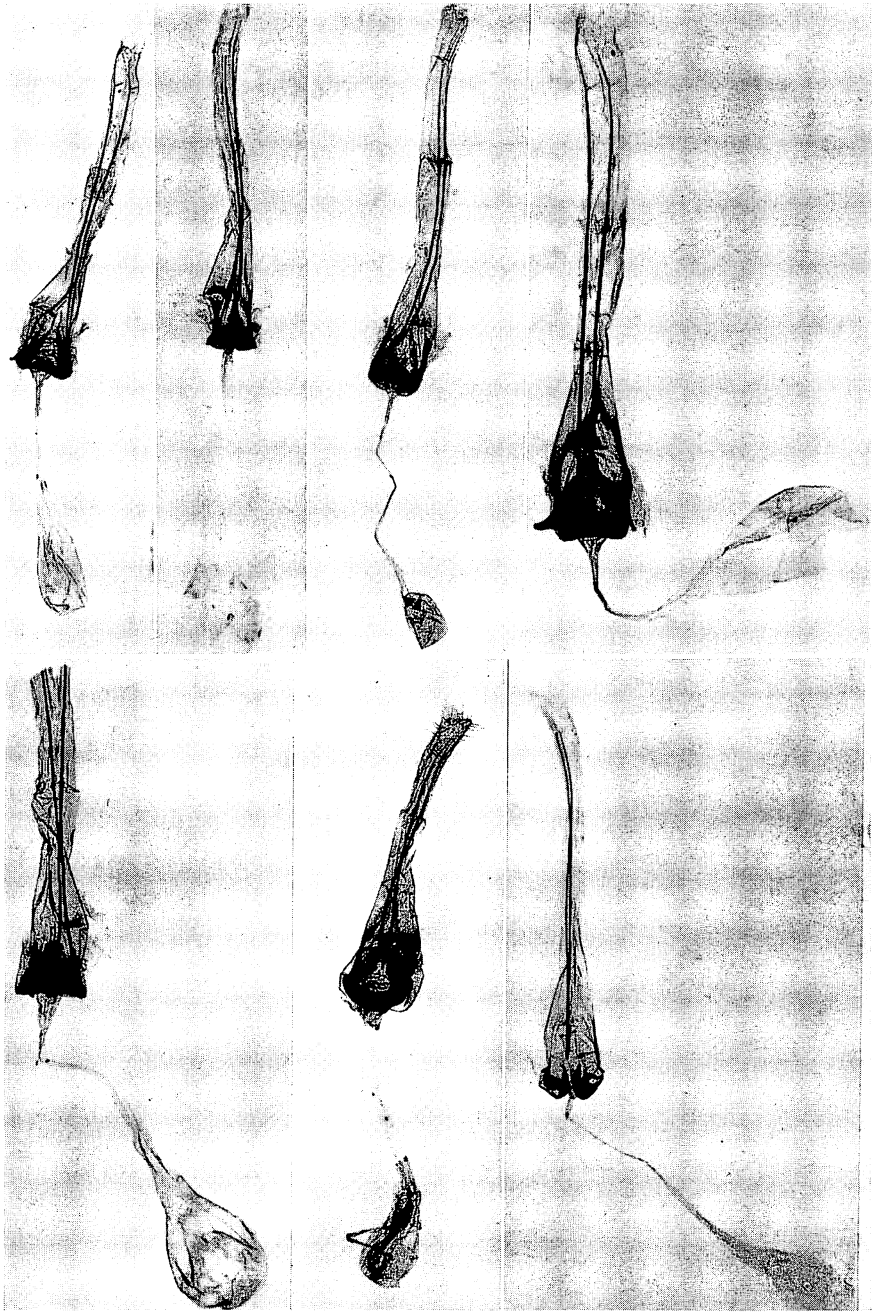


Figure 237—Female genitalia of *Orthomecyna* to show proportions and general conformation. Top row, left to right: *albicaudata* Butler, Blackburn example; *aphanopis* Meyrick, Blackburn example; *chrysophanes* Meyrick, Waimea Mts., Kauai, 4,000 feet; *epicausta* Meyrick, Kona, Hawaii, 4,000 feet. Bottom row, left to right: *exigua exigua* (Butler), Blackburn example; *heterodryas* Meyrick, Kilauea, Hawaii; *mesochasma* Meyrick, type, Kaholuamano, Kauai, 4,000 feet.

caterpillar he had found among the roots of sugarcane. This is the only record of the discovery of the larva of this genus. Perhaps the caterpillars are subterranean in habit, or they may bore in the basal parts of grass plants, and that is why they are unknown.

***Orthomecyna metalycia* Meyrick (figs. 222, 234).**

Orthomecyna metalycia Meyrick, 1899:241, pl. 6, fig. 22.

Endemic. Hawaii (type locality: Kona, 4,000 feet).

Hostplant: Unknown.

***Orthomecyna phaeophanes* Meyrick (figs. 222, 235).**

Orthomecyna phaeophanes Meyrick, 1899:241.

Endemic. Kauai, Oahu, Molokai (type locality: over 3,000 feet), Maui.

Hostplant: Unknown.

The assembled series under this name want critical examination to determine how many species are involved. Meyrick's series of six examples appears to represent six species.

***Orthomecyna picrodes* Meyrick (figs. 222, 235).**

Orthomecyna picrodes Meyrick, 1899:244, pl. 6, fig. 26.

Endemic. Hawaii (Hualalai, 8,000 feet).

Hostplant: Unknown.

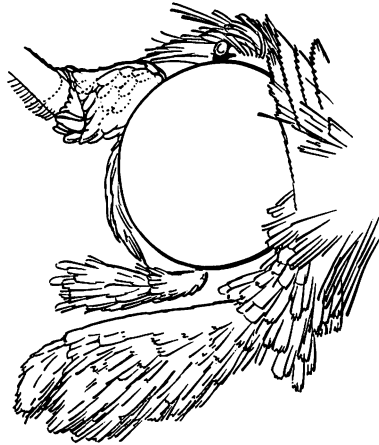


Figure 238—Head of *Mestolobes abnormis* (Butler).

Genus **MESTOLOBES** Butler, 1882:37

This peculiar endemic genus, together with its derivative *Promylaea*, has been placed in the Scopariinae; it does not belong to the Scopariinae. The wing venation and genitalia are quite distinct, as one can see from a glance at the illustrations. Meyrick (1888:228) said that *Mestolobes* was "certainly a further development of *Orthomecyna*," and I believe that he was more correct in that view than workers who have separated the two groups into different subfamilies, as Meyrick was led to do at a later date. I consider *Mestolobes* to be a genus of Crambinae which has lost the characteristic dorsal pecten on the medial vein of the hind wing. If it were not for its very unusual female genitalia, it could be considered a rather close ally of *Orthomecyna*. One of the greatest surprises of my study of the Hawaiian Lepidoptera has been the differences discovered between the female genitalia of *Orthomecyna* and *Mestolobes*. It is most remarkable how closely many of the species of *Mestolobes* and *Orthomecyna* parallel one another in color, pattern and general facies. It is often necessary to examine specimens very carefully before assigning them to one genus or the other. The illustrations give weight to these remarks. In spite of their differences, I believe that *Mestolobes* and *Orthomecyna* have stemmed from a similar source.

There have been several species of *Mestolobes* described from the Marquesas, but this has been done in error. The Marquesan species belong to *Idioblasta* Warren (1891:62, type *Idioblasta lacteata* Warren). Hampson (1899:239) sank *Idioblasta* as a synonym of *Pionea* in the Pyraustinae. He ignored the fact that

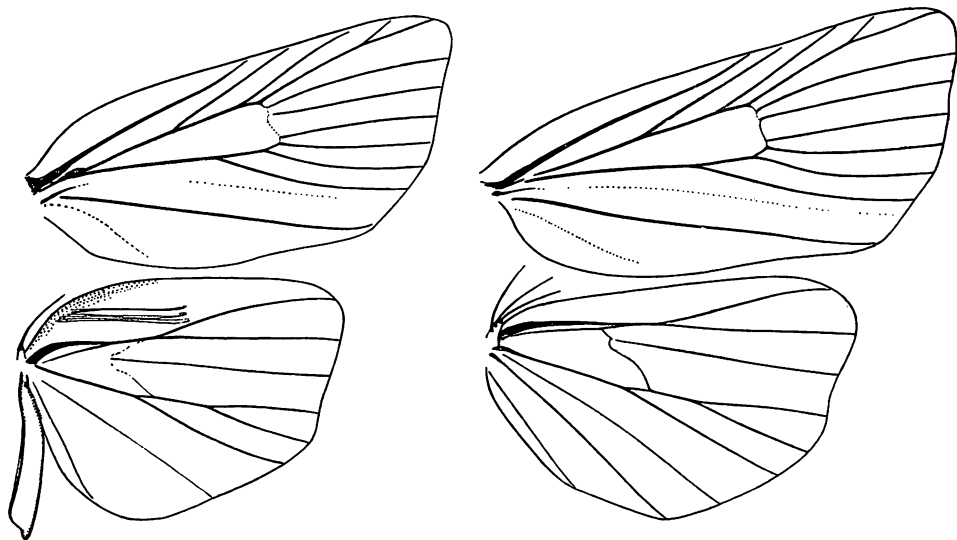


Figure 239—Male and female wing venation of *Mestolobes abnormis* (Butler). Only a few of the long, modified scales are shown along the costal margin of the hind wing of the male.

Idioblasta bears the typical Crambinae pecten in the hind wing. Hampson's latest arrangement in the British Museum has the species in *Hapalia*, also in the Pyraustinae. Meyrick (1929:165) noted Hampson's sinking *Idioblasta* under *Pionea*, and he pointed out that it is very distinct and redescribed it. Meyrick later (1934:340) sank *Idioblasta* as a synonym of *Mestolobes*. In his personal collection, now in the British Museum, Meyrick put *Idioblasta* in front of *Mestolobes* under the title "*Idioblasta* Meyr." [sic!]. It would be most helpful if Meyrick's conclusion that the two genera were the same could be substantiated, because we would then know extra-Hawaiian *Mestolobes* and might be able to say whence the genus came, but *Idioblasta* is not a synonym of *Mestolobes*. A careful examination will reveal quickly obvious differences between the genera. *Idioblasta* has a developed pecten on the hind wing, and the genitalia of both sexes are very different from *Mestolobes*. On *Idioblasta lacteata*, the type of *Idioblasta*, the male genital valves are of a basically distinct form from *Mestolobes*, and the uncus resembles an arm and hand with five long, outstretched fingers; the gnathos is a broad, apically truncated, sub-spatulate organ. The female genitalia show no resemblance to *Mestolobes*. Instead of the short, broad ovipositor of *Mestolobes*, *Idioblasta* has a narrow, greatly elongated ovipositor which exceeds the length of the remainder of the genitalia combined, there is no trace of the peculiar paired accessory sacs, and the female genitalia somewhat resemble those of *Orthomecyna*.

The male genitalia of *Mestolobes* are not greatly unlike those of *Orthomecyna*, but the female genitalia are very different. The ovipositor of *Orthomecyna* is very long, with long, wire-like apophyses, but the ovipositor of *Mestolobes* is short and broad. The most unusual feature of the female genitalia of *Mestolobes* is the remarkable paired accessory sacs (which vary in size between the species) which are shown in the illustrations. I have not seen such structures in any other genus of Lepidoptera.

Another peculiarity of *Mestolobes* is the strange lobe that arises from near the base of the hind wing in the males. I have called this lobe the "jugal lobe." It varies in form and development, and I have found it useful in separating some of the species. No other genus of Lepidoptera in Hawaii has such a structure.

The caterpillars are unknown, but Timberlake reared *chrysomolybdoides* from moss growing on a tree.

"Some of the species of *Mestolobes* (e.g. *M. xanthoscia*, *minuscule*, etc.) are frequent visitors to flowers, flying freely in the sunshine and also at night, while others appear to be entirely nocturnal, and come very freely to light in company with the former. Some may be seen in numbers flying over or settling on ferns in shady places. Most of the species are entirely confined to mountain forests . . ." (Perkins, 1913:161).

KEY TO THE SPECIES OF MESTOLOBES (MALES ONLY)

Because of difficulty in handling this poorly known group, I have decided to make a key based upon the males only. It is possible that the sexes are not all correctly matched in collections, and there is some sexual variation in color and pattern which easily may lead to confusion. Fortunately, males of all except *arctura* Meyrick, *droseropa* Meyrick (holotype lacks abdomen), *epidelta* Meyrick and *iochrysa* Meyrick are available, and thus 27 out of the 31 species now recognized can be placed in this key. The four species just named, which are known from females only, are all very dark, nearly black forms. I give a key to the unique types of these four species following the major key below.

The forms *chlorolychna*, *mesacma*, *pragmatica* and *semiiochrea* are closely interlinked, and *mesacma* and *pragmatica* are especially close. These may be geographical forms instead of full species.

Meyrick (1899:228-229) gave a key to the 28 species then known to him, but I have not been successful in using it.

1. Fore wings falcate, termen concave behind costal apex,
as in figure 253; Oahu **erinnys** Meyrick.
Fore wings not falcate, termen convex 2
- 2 (1). Hind wing with a subcostal hair-pencil (a patch of long,
specialized hair-scales behind costal area; the fore
wing may have to be lifted to see these scales) 3
Hind wing without such a subcostal hair-pencil 16
- 3 (2). Hind tibiae with a broad, conspicuous, expansible tuft
of dark or black scales 4
Hind tibiae without a tuft of modified scales 5a
- 4 (3). Hind wing mostly brown or fuscous and not largely
white; antemedial line of fore wing appearing mostly
dark, as in figure 267; Molokai **scleropis** Meyrick.
Hind wing largely white except distad where it is partly
but inconspicuously dark 5
- 5 (4). Jugal lobe of hind wing with a large, wide, obtuse, sub-
apical emargination on inner margin; Oahu
. **abnormis** (Butler).
Jugal lobe with a small, rather obscure and easily over-
looked, narrow, subapical notch on inner edge; Oahu
. **antichora** Meyrick.
- 5a (3). Hind femora expanded by a conspicuous mass of spe-
cialized scales on lower edge; another tuft of special-
ized scales between medial and posterior sets of spurs
on hind tibiae; Kauai **aphrias** Meyrick.
Not so 6
- 6 (5a). Very dark fuscous or mostly black species 7
Not such dark species 8

- 7(6). Fore wings without orange markings, almost concolorous and without distinct markings; cilia of hind wings dark; a small (12 mm.) species from Lanai. **sirina** Meyrick.
 Fore wings with antemedial and postmedial lines marked on costa by variable orange patches, the orange scales extending along the lines for variable distances; cilia of hind wings white; Kauai. . . **chrysomolybda** Meyrick.
- 8(7). Fore and hind wings nearly uniformly concolorous above, either fuscous or yellowish, not distinctly marked; hind wings without extensive white discal area. 9
 Fore wings with lines and spots well developed, hind wings often, but not always, white in disc. 10
- 9(8). Fore wings yellow; Maui. **homalopa** Meyrick.
 Fore wings fuscous; Molokai. **sicaria** Meyrick.
- 10(9). Antemedial line of fore wing not including a well-defined or broad white line or band. 11
 Antemedial line of fore wing including or adjoined by a well-marked white line or broad white band. 12
- 11(10). Fore wings basically orange; hind wings mostly nearly black, the dark color extending entirely around posterior part of wing; jugal lobe yellow with black tip; antennae very strikingly black-marked; Oahu. **ochrias** Meyrick.
 Fore wings basically fuscous; hind wings white with dark on tornus; jugal lobe whitish and not black-tipped; antennae not strongly marked; Oahu. **autodoxa** Meyrick.
- 12(10). Hind wings almost entirely fuscous. 13
 Hind wings fuscous only distad, disc white. 14
- 13(12). Palpi extending beyond front of eyes for a distance only slightly greater than length of an eye (viewed from above); antemedial pale or white line a comparatively narrow line, not a broad, white band; jugal lobe of hind wing small, held close against wing, appearing more as a tuft of hair than a lobe; several (?) islands. **minuscule** (Butler).
 Palpi extending beyond front of eyes for nearly twice the length of an eye; antemedial line a broad, white fascia; jugal lobe of hind wing large, free, with a large black tuft; Lanai. **eurylyca** Meyrick.
- 14(12). Jugal lobe of hind wing clothed with white hair and scales, no black scales beneath; Kauai. **orthrias** Meyrick.

- Jugal lobe black-tipped beneath.....15
- 15 (14). Dark band on hind wing continued entirely around the wing; pattern as in figure 266; Maui (type 21 mm. in expanse).....**pessias** Meyrick.
Dark band on hind wings not extending basad much beyond middle; pattern as in figure 266; Kauai (type 13 mm. in expanse).....**perixantha** Meyrick.
- 16 (2). Hind wings white or yellowish with dark outer borders...17
Hind wings fuscous to black.....20
- 17 (16). Hind tibiae each with a large tuft of modified black scales.....18
Hind tibiae without tufts.....19
- 18 (17). Dark border of hind wings continued basad to or beyond vein 1c; jugal lobe with some black scales beneath; Hawaii.....**chlorolychna** Meyrick.
Dark border of hind wings hardly reaching middle of wing and at most ill-defined basad of middle; under side of jugal lobes white-scaled; Oahu.....**semiochrea** Butler.
- 19 (18). Dark border of hind wings continued at nearly its full width basad nearly to inner edge of wing; Molokai.....**mesacma** Meyrick.
Dark border of hind wings either not extending much basad of middle, or much narrowed beyond middle; Hawaii.....**pragmatica** Meyrick.
- 20 (16). Jugal lobe of hind wing large, free and conspicuous, expanded distad and bearing a large tuft of dark and mixed modified scales; postmedial line an arcuate, metallic band; Hawaii.....**amethystias** Meyrick.
Jugal lobe of hind wing reduced, held close against wing margin and inconspicuous.....21
- 21 (20). A large species 20 mm. or more in expanse from Haleakala, Maui; wing pattern as in figure 245.....**chimonias** Meyrick.
Much smaller species, not over 20 mm. in expanse.....22
- 22 (21). Fore wing strongly banded; antemedial, two medial and postmedial lines pale, iridescent; four transverse yellow bands beyond the pale, antemedial line; hind wings pale fuscous; Oahu.....**quadrifasciata** Swezey.
Not so.....23
- 23 (22). A very black little species from Oahu, with basal, submedial and subapical iridescent, lead-colored bands; fringes white on anterior part black on posterior part of each wing; palpi yellow...**chrysomolybdoides** Swezey.

- Without such iridescent, lead-colored bands on fore wings.....24
- 24 (23). Fore wings with patches of white, yellow, pale and dark fuscous; Hawaii.....**banausa** Meyrick.
Without white patches on fore wings.....25
- 25 (24). Fore wings with submedial and postmedial arcuate yellow bands; Oahu, Hawaii.....**xanthoscia** Meyrick.
Fore wings nearly concolorous, without such yellow bands; Molokai, Lanai.....**ombrias** Meyrick.

KEY TO THE FOUR SPECIES OF MESTOLOBES KNOWN ONLY
FROM FEMALE HOLOTYPE

1. Fore wings with antemedial, postmedial and subterminal yellow bands; Kauai.....**iochrysa** Meyrick.
Fore wings not yellow-banded.....2
- 2 (1). Fringes of hind wings white; fore wings with a white costal patch at about apical three-fourths and a larger white patch just before middle of posterior margin; Kauai.....**epidelta** Meyrick.
Fringes of hind wings black or mixed; fore wing pattern different.....3
- 3 (2). Fore wings well mixed with patches of yellow, white and black on fuscous background; Hawaii.....
.....**droseropa** Meyrick.
Fore wings brownish-fuscous with scattering of purplish-white scales faintly indicating the bands and lines; Molokai.....**arctura** Meyrick.

Mestolobes abnormis (Butler) (figs. 238, 239, 240, 242). Type of *Mestolobes*.
Metasia ? abnormis Butler, 1882:35.
Mestolobes aenone Butler, 1882:37. Meyrick, 1888:228; 1899:239; 1904:361.
Hampson, 1897:229, synonymy.
Mestolobes abnormis (Butler) Hampson, 1897:228, figures.

Endemic. Oahu (type locality: "occurring on rocks in the bed of a mountain stream near Honolulu, over which it flies freely in the sunshine").

Hostplant: Unknown. The adults have been taken at the flowers of *Metrosideros*. Butler's *abnormis* is the female and *aenone* the male.

Mestolobes amethystias Meyrick (figs. 240, 243).
Mestolobes amethystias Meyrick, 1899:229, pl. 6, fig. 10.

Endemic. Kauai (type locality: Kaholuamano, 4,000 feet), Hawaii.
Hostplant: Unknown.

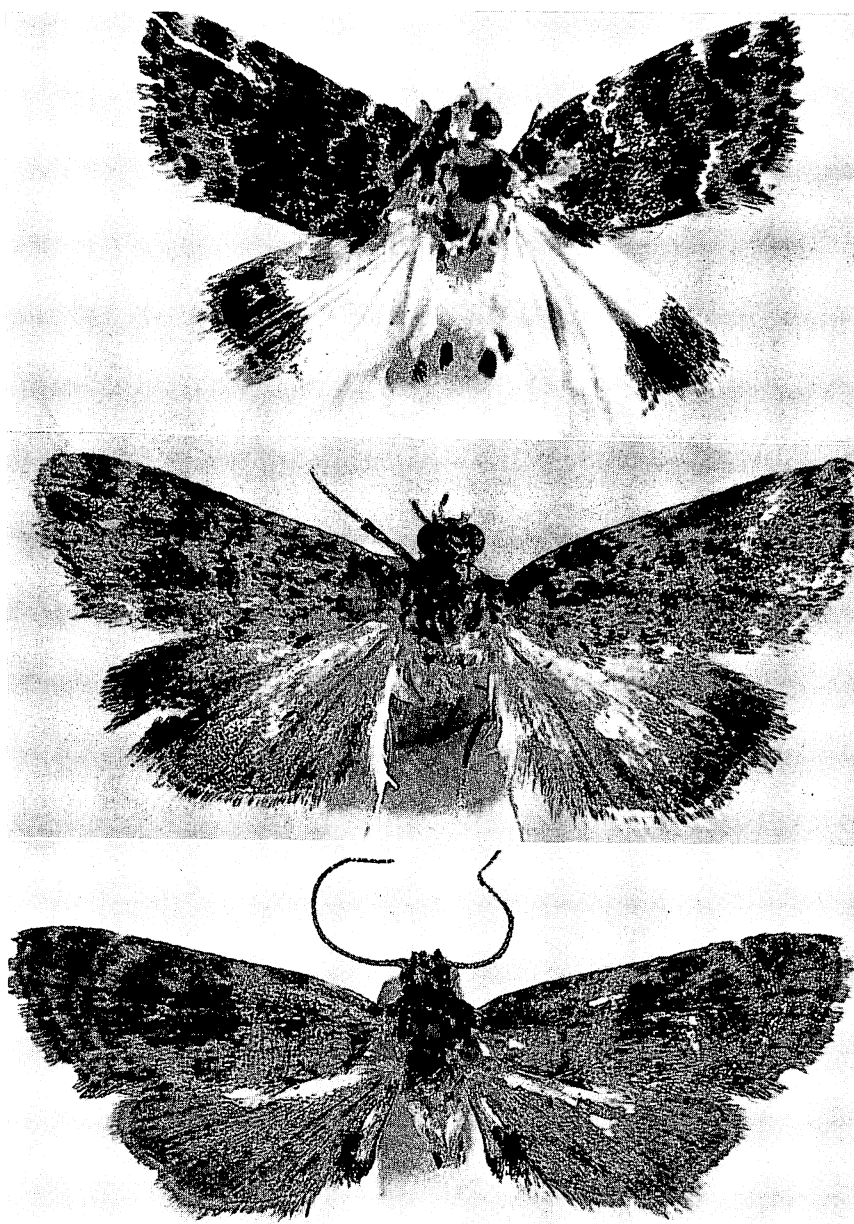


Figure 240—*Mestolobes*. Above: *abnormis* (Butler), the male type of the synonym *aenone* Butler; "Hawaiian Is. 82-9 155" (Blackburn); expanse, 10.5 mm., wings bent strongly ventrad. Center: The female type of *abnormis* (Butler); "Hawaiian Isls. 82-9 165"; expanse, 7.5 mm. Below: *amethystias* Meyrick, paratype; Kilauea, Hawaii; expanse, 13.5 mm.

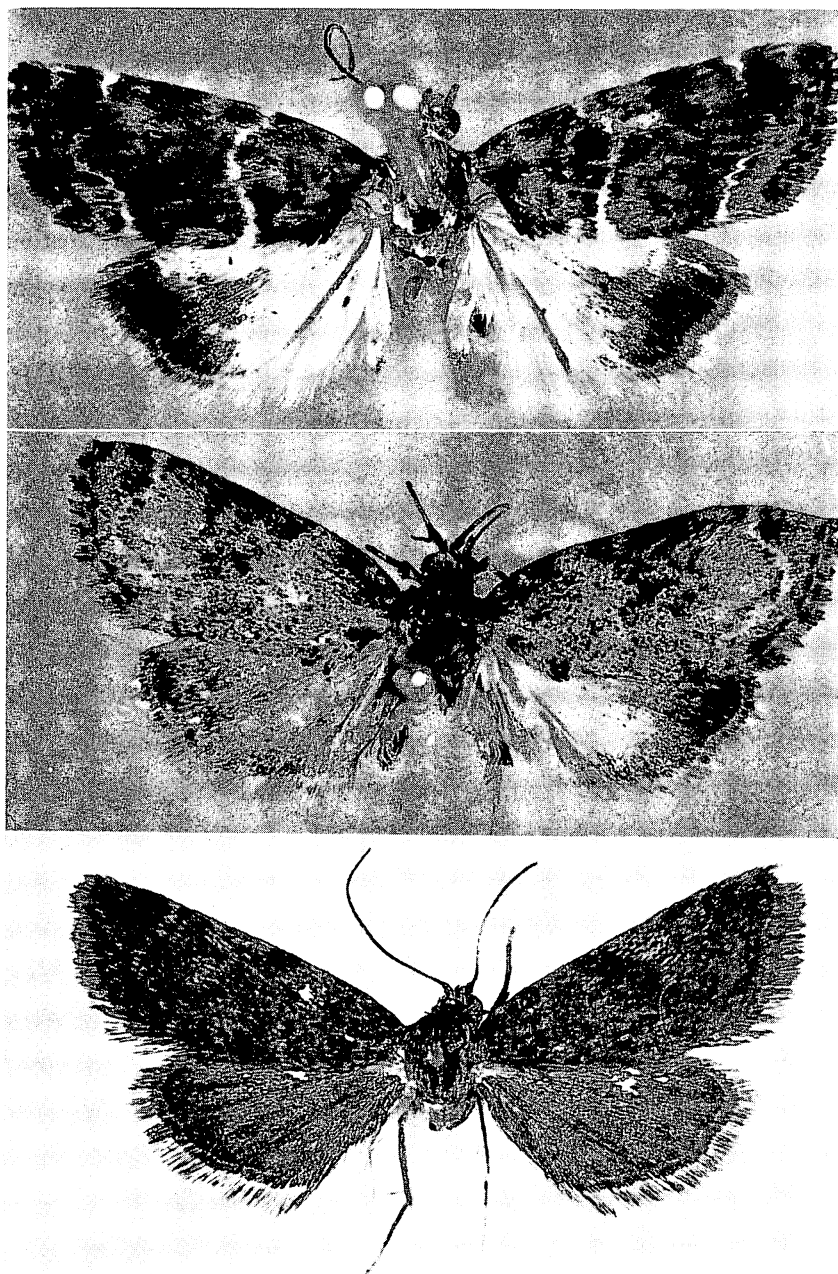


Figure 241—*Mestolobes*. Above: The male type of *antichora* Meyrick; southeast Koolau Mts., Oahu; expanse, 16 mm. Center: The male type of *aphrias* Meyrick; Kaholuamano, Kauai, 4,000 feet; expanse, 20 mm. Below: the female type of *arctura* Meyrick; Molokai Mts., above 4,500 feet; expanse, 13 mm.

Mestolobes antichora Meyrick (figs. 241, 244).

Mestolobes antichora Meyrick, 1904:361.

Endemic. Oahu (type locality: southeast Koolau Mountains).

Hostplant: Unknown. The adults have been taken at the flowers of *Metrosideros*.

Meyrick stated in his original description that the male does not have a costal hair-pencil in the hind wings. This is in error. The type has a very distinct and well-developed hair-pencil. It was partially hidden on the right wing of the type because of the way the specimen was set, but it came into view when I exposed it with a needle.

Mestolobes aphrias Meyrick (figs. 241, 245).

Mestolobes aphrias Meyrick, 1899:237.

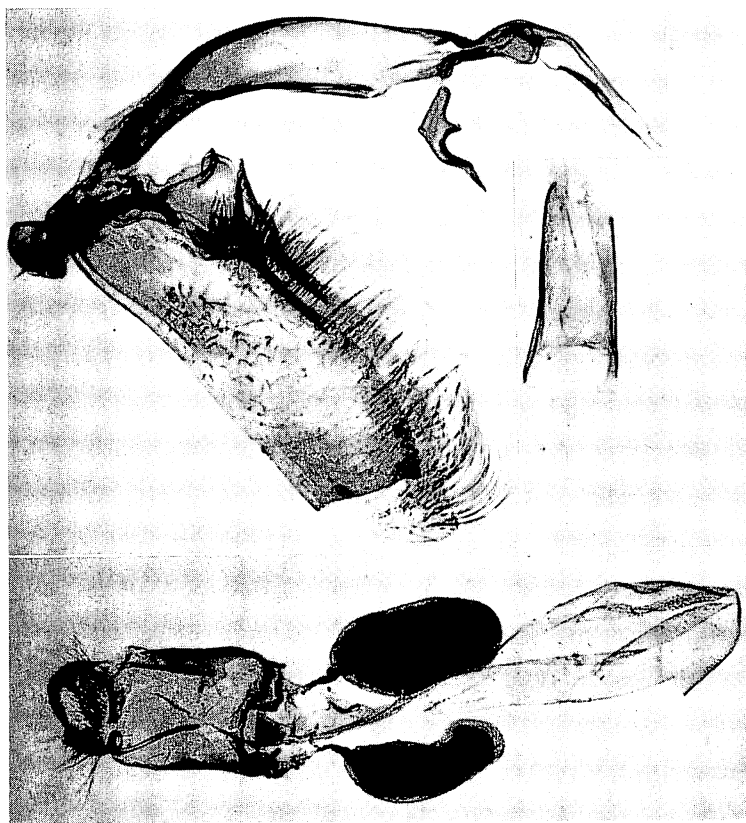


Figure 242—Male and female genitalia of *Mestolobes abnormis* (Butler). Above: Lateral view of the male genitalia of the type of *aenone* Butler, a synonym; end of left valve broken. The female genitalia belong to the type of *abnormis*. Note the unusual paired sacs characteristic of this genus.

Endemic. Kauai (type locality: Kaholuamano, 4,000 feet).

Hostplant: Unknown.

Meyrick, in his original description, makes no mention of the tufts of scales on the hind femora and tibiae of the male.

Mestolobes arctura Meyrick (figs. 241, 244).

Mestolobes arctura Meyrick, 1899:231; 1904:133.

Endemic. Molokai (type locality: over 4,500 feet).

Hostplant: Unknown.

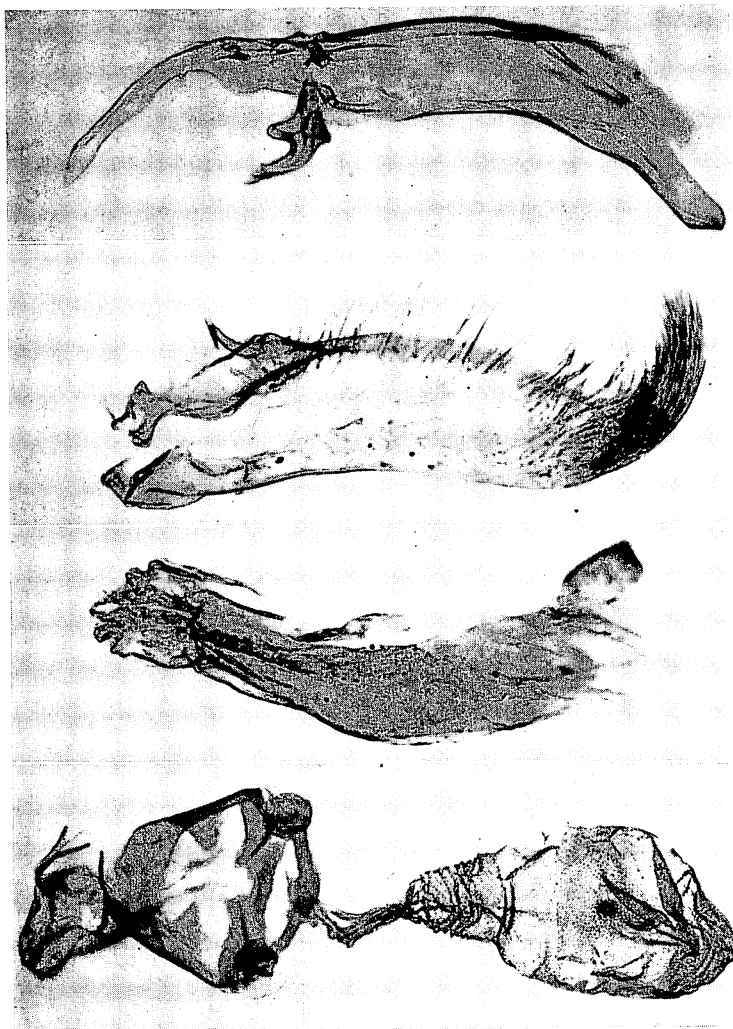


Figure 243—*Mestolobes amethystias* Meyrick. Above: Lateral view of tegumen, uncus and gnathus, then a right valve and the aedeagus. Below: The female genitalia of the type; Kauai.

The female has a remarkable, large, broad, apically truncated, heavy mass of black hair-scales, which resembles a shaving brush, at the apex of the abdomen.

Mestolobes autodoxa Meyrick (figs. 246, 248).

Mestolobes autodoxa Meyrick, 1899:239, pl. 6, fig. 21; 1904:361.

Endemic. Oahu (type locality: Waianae Mountains).

Hostplant: Unknown. The adults have been taken at *Metrosideros* flowers.

The type has lost its abdomen.

Mestolobes banausa Meyrick (figs. 246, 249).

Mestolobes banausa Meyrick, 1899:233.

Endemic. Hawaii (type locality: Kona, 4,000 feet).

Hostplant: Unknown.

Mestolobes chimonias Meyrick (figs. 246, 249).

Mestolobes chimonias Meyrick, 1899:236.

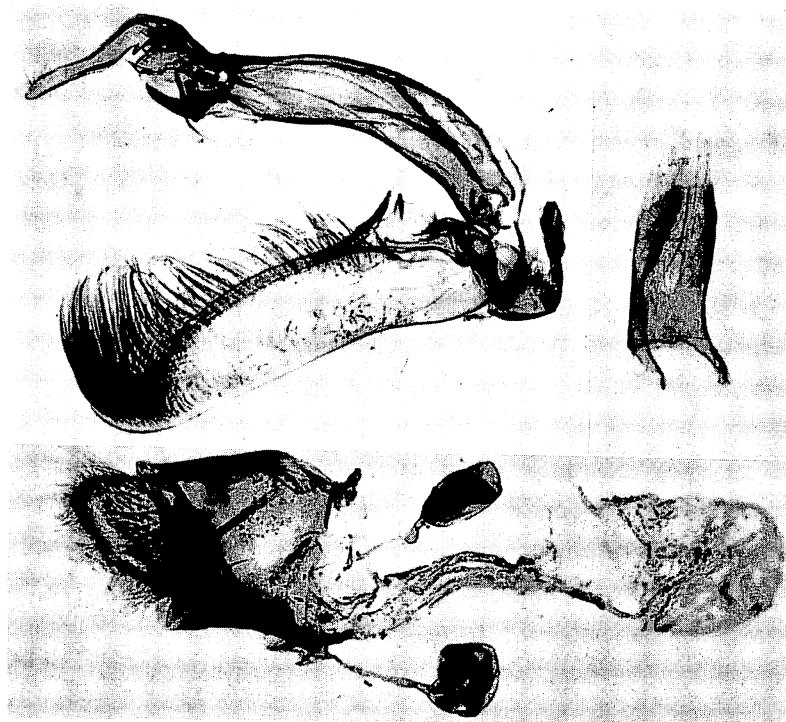


Figure 244—*Mestolobes*. Above: Male genitalia, lateral view, right valve removed, of the type of *antichora* Meyrick; southeast Koolau Mts., Oahu. Below: The female genitalia of the type of *arctura* Meyrick; Molokai.

Endemic. Molokai, Maui (type locality: Haleakala, 6,000 feet).

Hostplant: Unknown.

The abdomen has been lost from the female holotype.

Mestolobes chlorolychna Meyrick (figs. 247, 250).

Mestolobes chlorolychna Meyrick, 1899:237.

Mestolobes chorolychna Klima, misspelling.

Endemic. Hawaii (type locality: Kona, 4,000 feet).

Hostplant: Unknown.

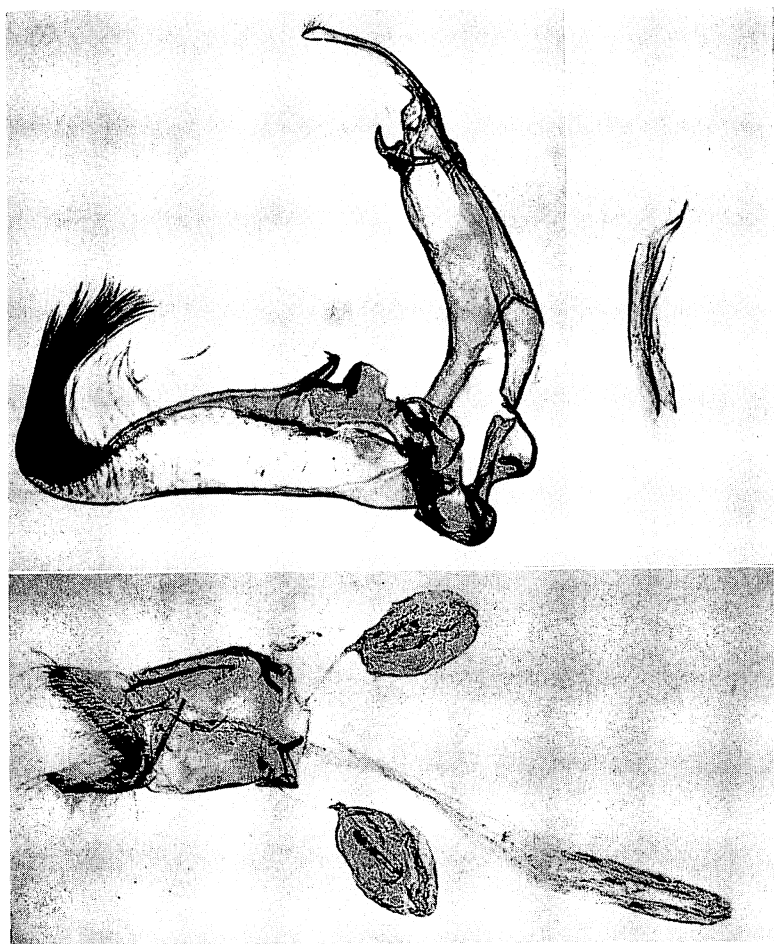


Figure 245—*Mestolobes aphrias* Meyrick. Above: Genitalia of the male type; lateral view, right valve removed. Below: Female genitalia; Kauai.

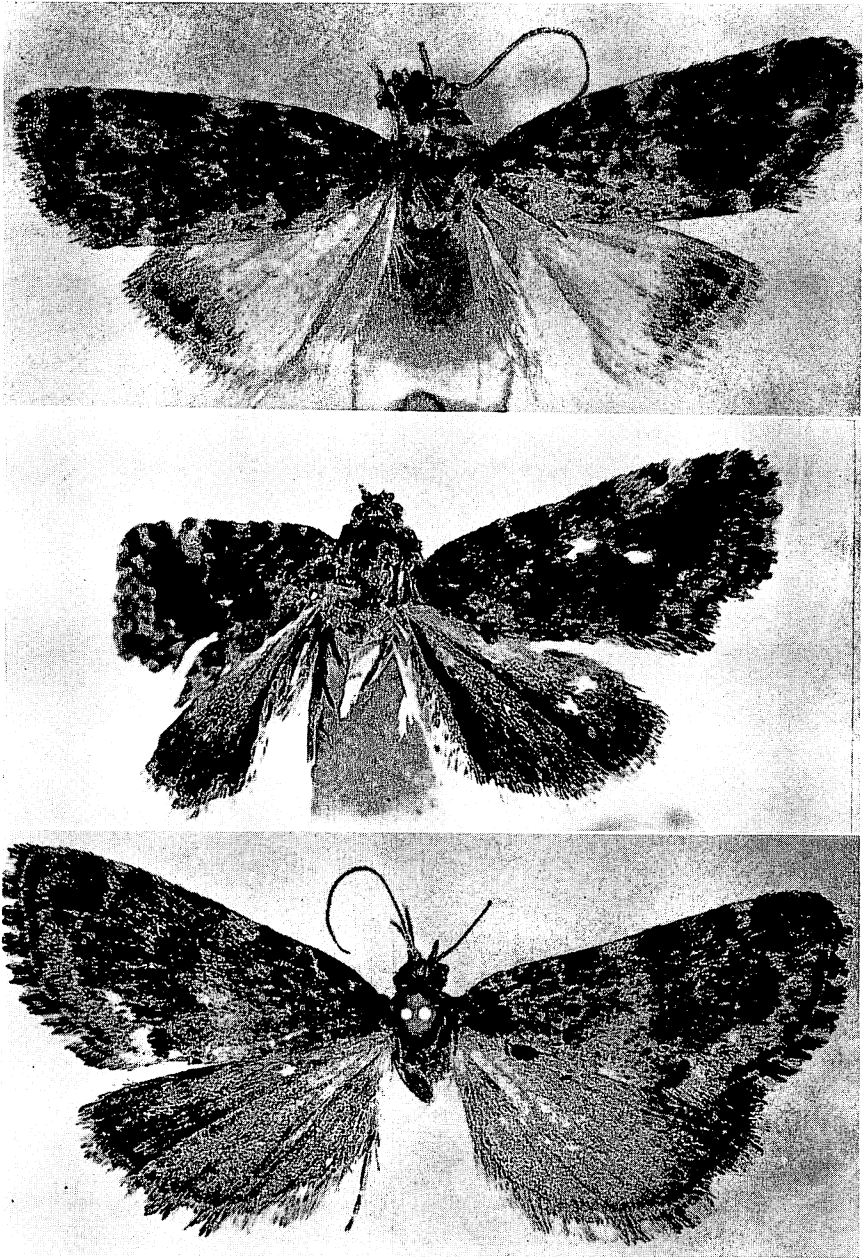


Figure 246—*Mestolobes*. Above: *autodoxa* Meyrick, type; Waianae Mts., Oahu; expanse, 14 mm. Center: *banausa* Meyrick, type; Kona, Hawaii, 4,000 feet; right wing, 6.5 mm. long. Below: *chimonias* Meyrick, type; Haleakala, Maui, 6,000 feet; expanse, 22.5 mm.

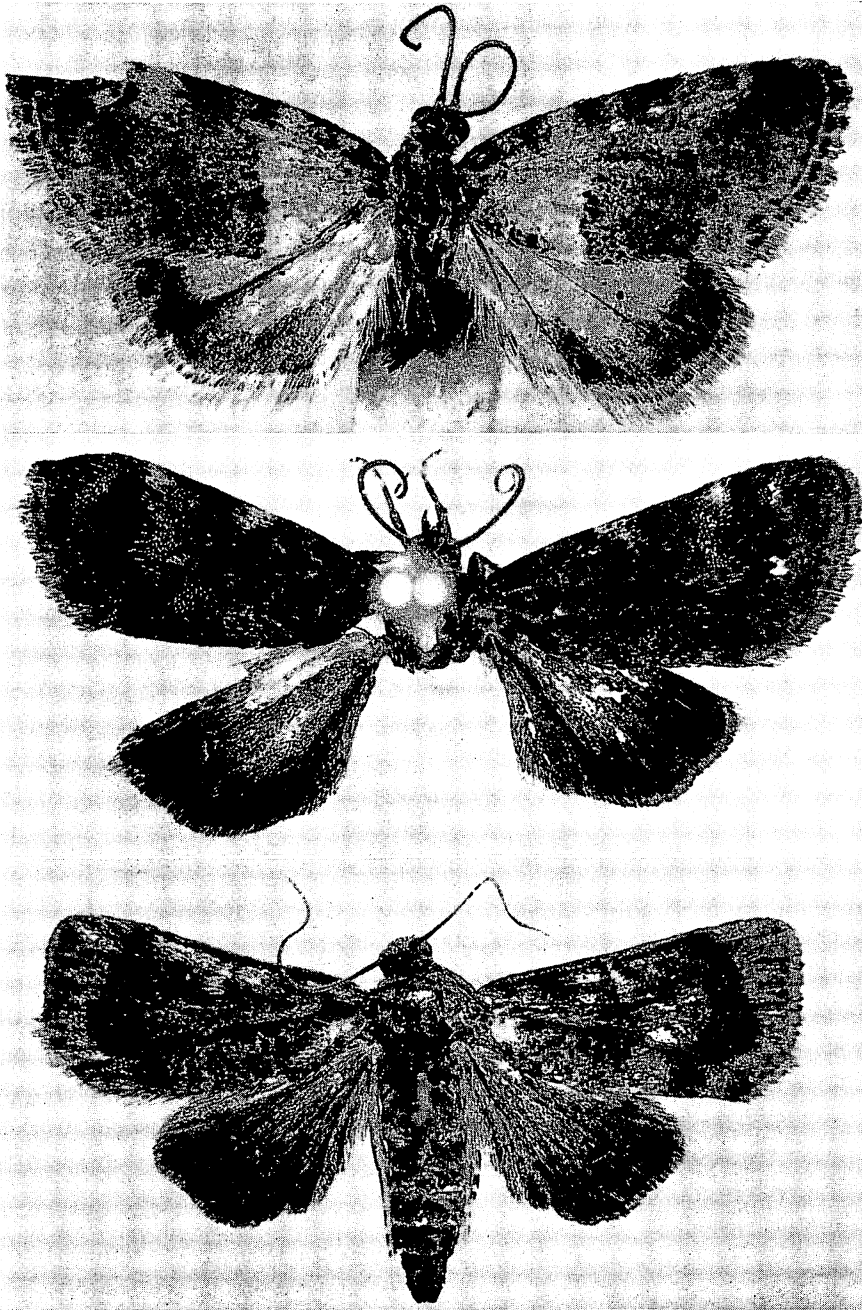


Figure 247—*Mestolobes*. Above: *chlorolychna* Meyrick, male type; Kona, Hawaii, 4,000 feet; expanse, 15.5 mm. Center: *chrysomolybda* Meyrick, male type; Kaholuamano, Kauai, 4,000 feet; expanse, 15 mm. Below: *chrysomolybdoides* Swezey, type; Mt. Kaala, Oahu, 2,500 feet; length of right fore wing, 6 mm. The white fringe on the hind wing and front half of fore wing does not show in this photograph.

Mestolobes chrysomolybda Meyrick (figs. 247, 250, 251, 252).

Mestolobes chrysomolybda Meyrick, 1899:230, pl. 6, fig. 11.

Mestolobes crypsichrysa Meyrick, 1899:230. **New synonym.**

Endemic. Kauai (type locality: Kaholuamano, 4,000 feet).

Hostplant: Unknown.

The types of *chrysomolybda* and *crypsichrysa* were taken together on Kauai. Meyrick's descriptions are not correct in all details. The jugal lobe, hair-pencil and fringe in the hind wing are similar in the types. Meyrick said that the costal hair-pencil in *chrysomolybda* was whitish, but I consider it yellow. The type of *crypsichrysa* does not have the leaden bands developed as in *chrysomolybda*, but this may be a variable feature and may possibly be connected with the freshness of the example. The genitalia are similar.

Mestolobes chrysomolybdoides Swezey (fig. 247).

Mestolobes chrysomolybdoides Swezey, 1920:380, figured.

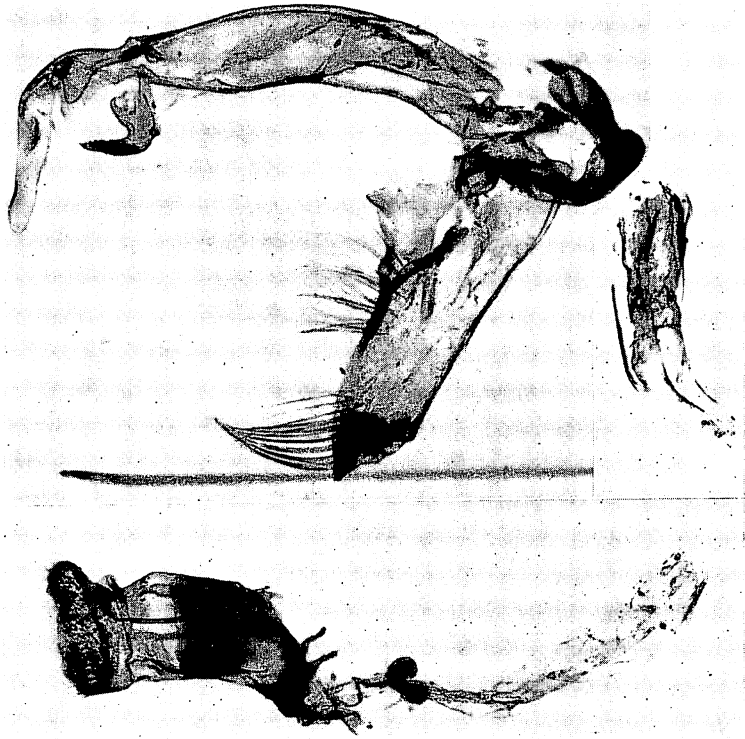


Figure 248—*Mestolobes autodoxa* Meyrick. Male (lateral view, right valve removed, left valve broken at apex) and female genitalia of paratypes; Oahu.

Endemic. Oahu (type locality: Mt. Kaala, about 2,000 feet).

Hostplant: The two females which made up the original series were reared from "moss" taken from a tree.

Dr. Swezey has told me that a number of males, which he considered this species, were taken later at light on Mount Tantalus and that they do not have the yellow streak in the costal part of the "first line" which is present on the fore wing of the female. He also says that the male lacks the tornal lobe and costal hair-pencil in the hind wing. I have not checked the specimens.

Mestolobes droseropa Meyrick (fig. 252).

Mestolobes droseropa Meyrick, 1899:232.

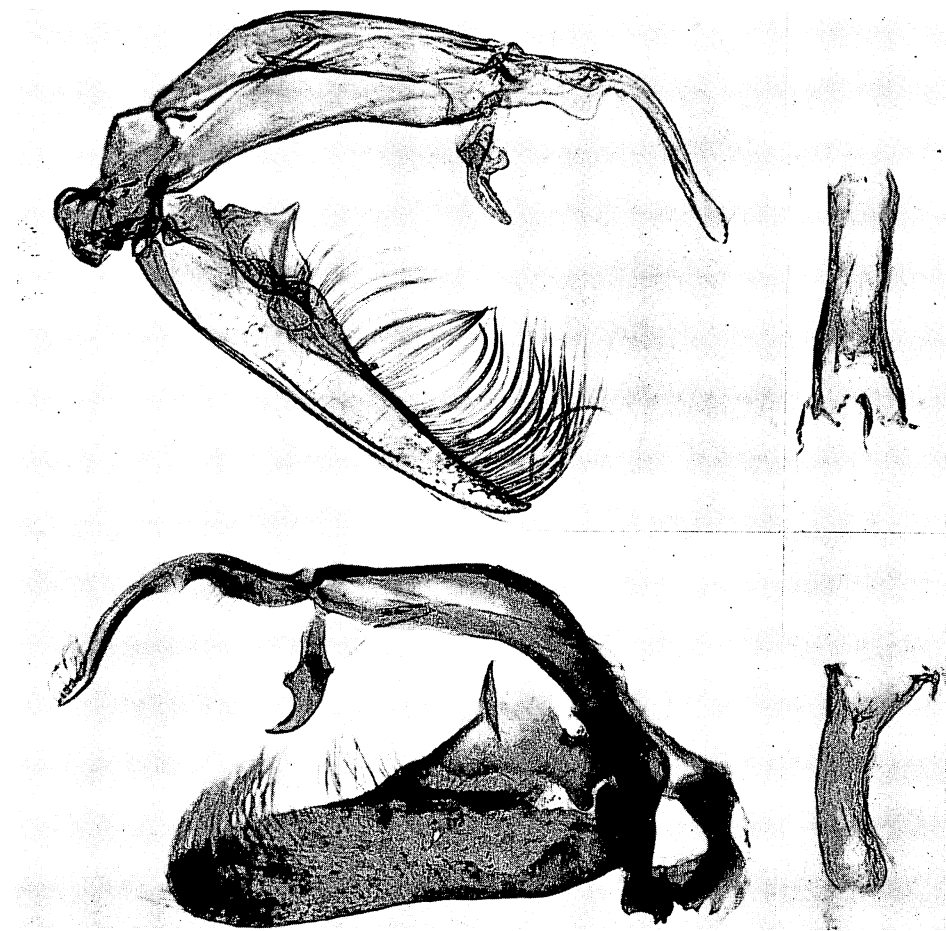


Figure 249—*Mestolobes*. Male genitalia, lateral views with one valve removed. Above: *banausa* Meyrick, type; Kona, Hawaii, 4,000 feet. Below: *chimonias* Meyrick; Haleakala, Maui, 5,000 feet; aedeagus upside down.

Endemic. Hawaii (type locality: Kilauea ?).

Hostplant: Unknown.

The female holotype, the only specimen known, has lost its abdomen. The only data on the specimen are "VIII" and "Sandwich Is. 99-227." I am not certain, but this might be the female of *banausa*.

Mestolobes epidelta Meyrick (figs. 251, 252).

Mestolobes epidelta Meyrick, 1899:231, pl. 6, fig. 13.

Endemic. Kauai (type locality: Waimea Mountains, 3,000 to 4,000 feet).

Hostplant: Unknown.

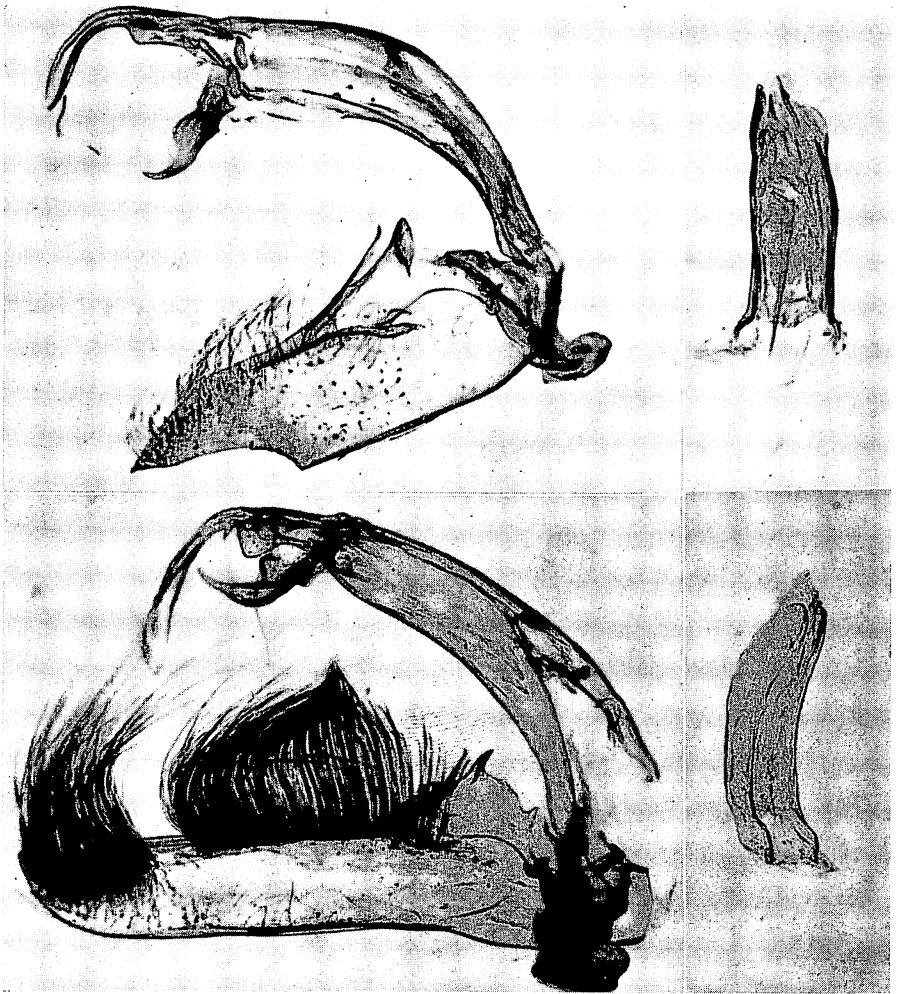


Figure 250—Male genitalia of *Mestolobes*; lateral view, right valves removed. Above: *chrysomolybda* Meyrick, type; Kaholuamano, Kauai, 4,000 feet; apical part of valve broken off. Below: *chlorolychna* Meyrick, type; Kona, Hawaii, 4,000 feet.

Mestolobes erinnys Meyrick (figs. 253, 255).*Mestolobes erinnys* Meyrick, 1899:231, pl. 6, fig. 12.*Mestolobes erynnis* Klima, 1937:56, misspelling.

Endemic. Kauai (type locality: Waianae Mountains, 2,200 feet).

Hostplant: Unknown.

Mestolobes eurylyca Meyrick (figs. 253, 255).*Mestolobes eurylyca* Meyrick, 1899:235.

Endemic. Lanai (type locality: 2,000 feet).

Hostplant: Unknown.

Mestolobes homalopa Meyrick (figs. 253, 254).*Mestolobes homalopa* Meyrick, 1899:240.

Endemic. Maui (type locality: Haleakala, 5,000 feet).

Hostplant: Unknown.

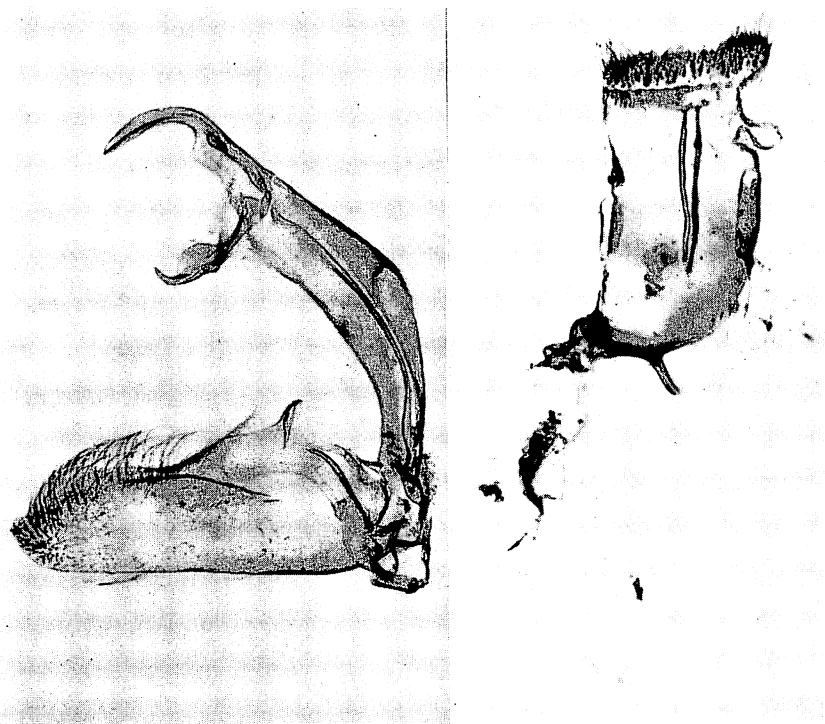


Figure 251—*Mestolobes*. Left: Lateral view of male genitalia, right valve removed, of the type of *cryptichrysa* Meyrick, a synonym of *chrysomolybda* Meyrick; Kaholuamano, Kauai, 4,000 feet. Right: Female genitalia of *epidelta* Meyrick, type; Waimea Mts., Kauai, 3,000–4,000 feet; in poor condition, abdomen evidently partially decomposed.

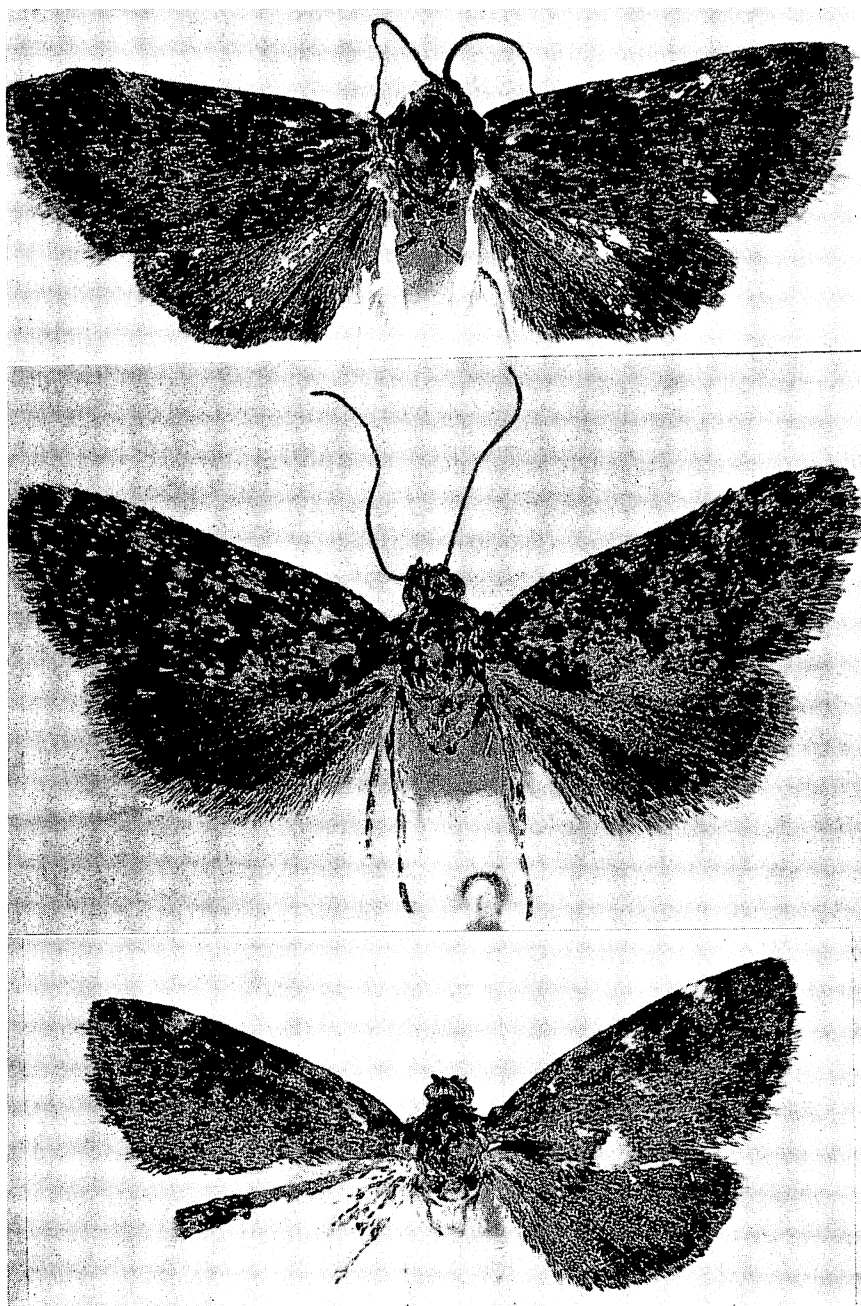


Figure 252—*Mestolobes*. Above: The male type of *crypsichrysa* Meyrick, a synonym of *chrysomolybda* Meyrick; Kaholuamano, Kauai, 4,000 feet; expanse, 14 mm.; the white fringe on the hind wings does not show in the illustration. Center: *droseropa* Meyrick, female type; "VIII" "Sandwich Is. 99-227" (Blackburn); expanse, 15.5 mm. Below: *epidelta* Meyrick, female type; Waimea Mts., Kauai, 3,000-4,000 feet; expanse, 13 mm.

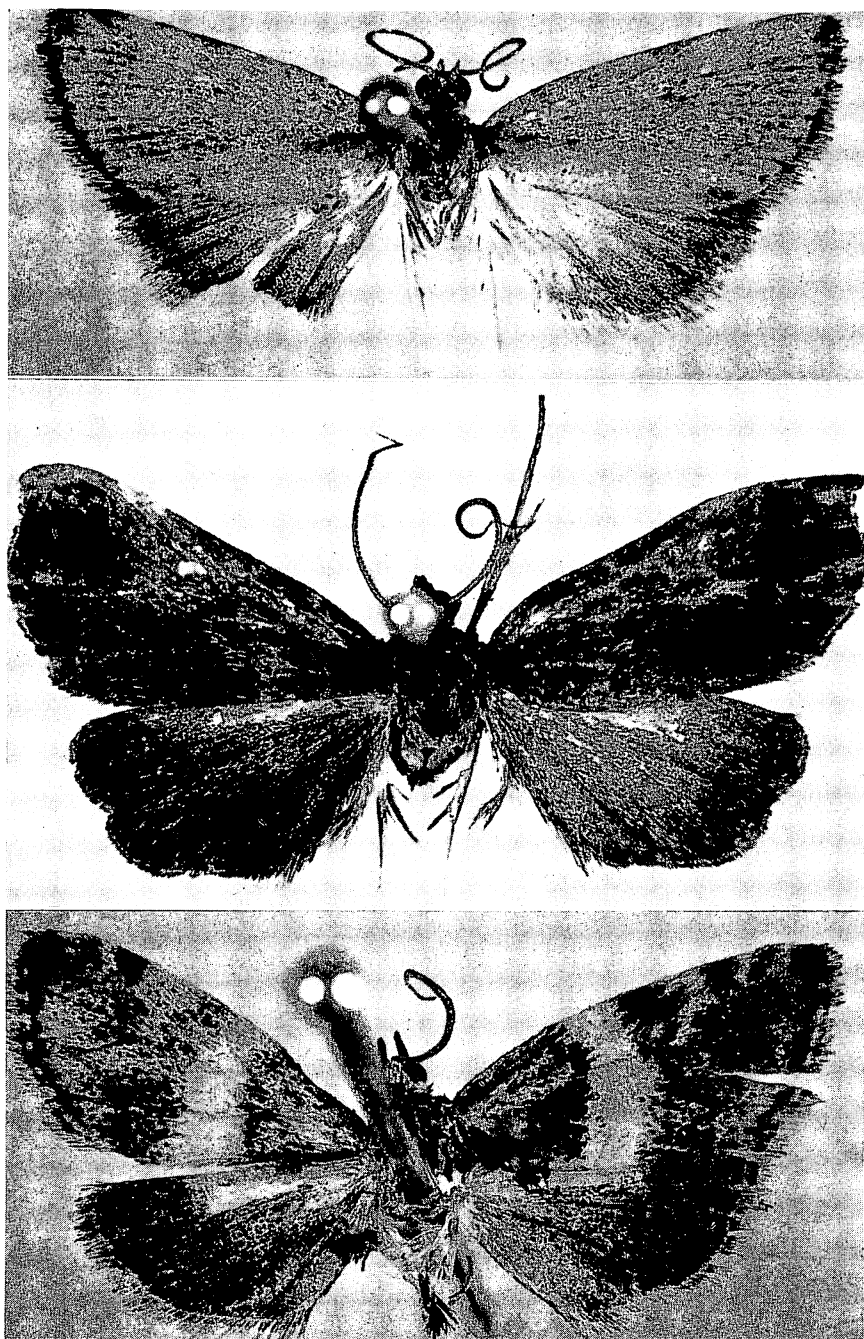


Figure 253—*Mesotolobes*. Above: *homalopa* Meyrick, male type; Haleakala, 5,000 feet; expanse, 16 mm.; note the pin shadows on each wing. Center: *erinnys* Meyrick, male type; Waianae Mts., Oahu, 2,200 feet; expanse, 18 mm.; this photograph is too dark. Below: The male type of *eurylyca* Meyrick; Lanai, 2,000 feet; expanse, 14.5 mm.

Mestolobes iochrysa Meyrick (figs. 256, 258).

Mestolobes iochrysa Meyrick, 1899:232, pl. 6, fig. 14.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Mestolobes mesacma Meyrick (figs. 256, 260).

Mestolobes mesacma Meyrick, 1899:237, pl. 6, fig. 19.

Endemic. Molokai (type locality: 3,000 feet), Maui, Hawaii.

Hostplant: Unknown.

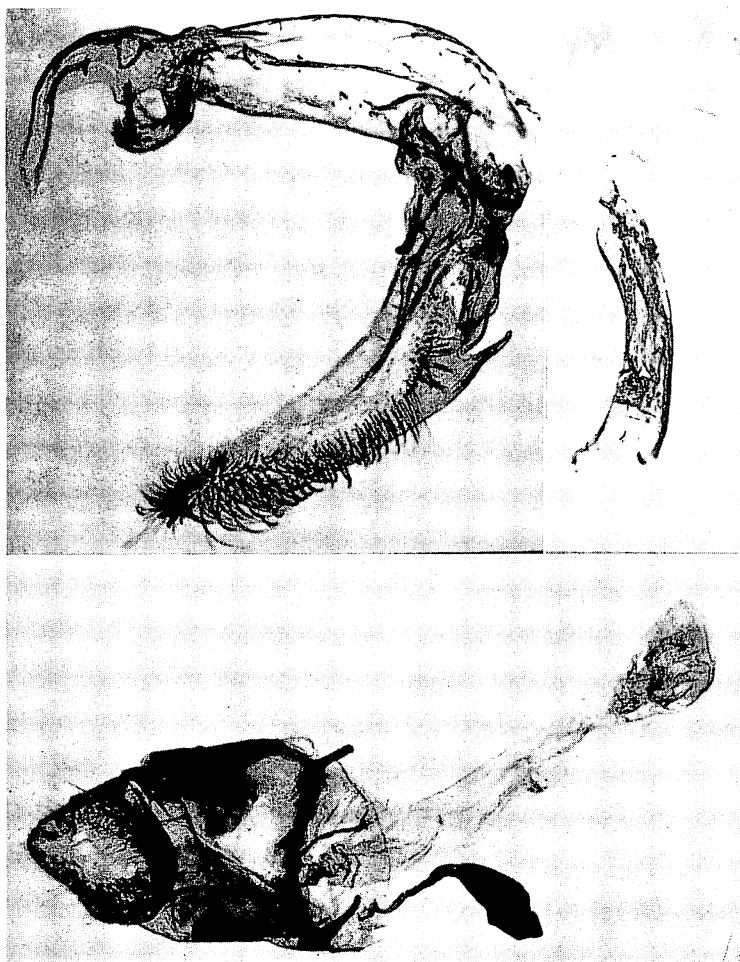


Figure 254—*Mestolobes homologa* Meyrick. Above: Lateral view of male genitalia, right valve removed, type; Haleakala, Maui, 5,000 feet. Below: Female genitalia; Maui example.

Mestolobes minuscula (Butler) (figs. 256, 259, 260).

Boreophila minuscula Butler, 1881:325.

Mestolobes simaethina Butler, 1882:38. Hampson, 1897:229, synonymy.

Mestolobes minuscula (Butler) Meyrick, 1888:230; 1899:233; 1904:361. Hampson, 1897:229.

Endemic. Kauai, Oahu, Molokai, Maui (type locality: Haleakala, 4,000 feet), Lanai, Hawaii.

Hostplant: Unknown.

Dr. Swezey reported (*Proc. Hawaiian Ent. Soc.* 7(3):484, 1931) rearing a

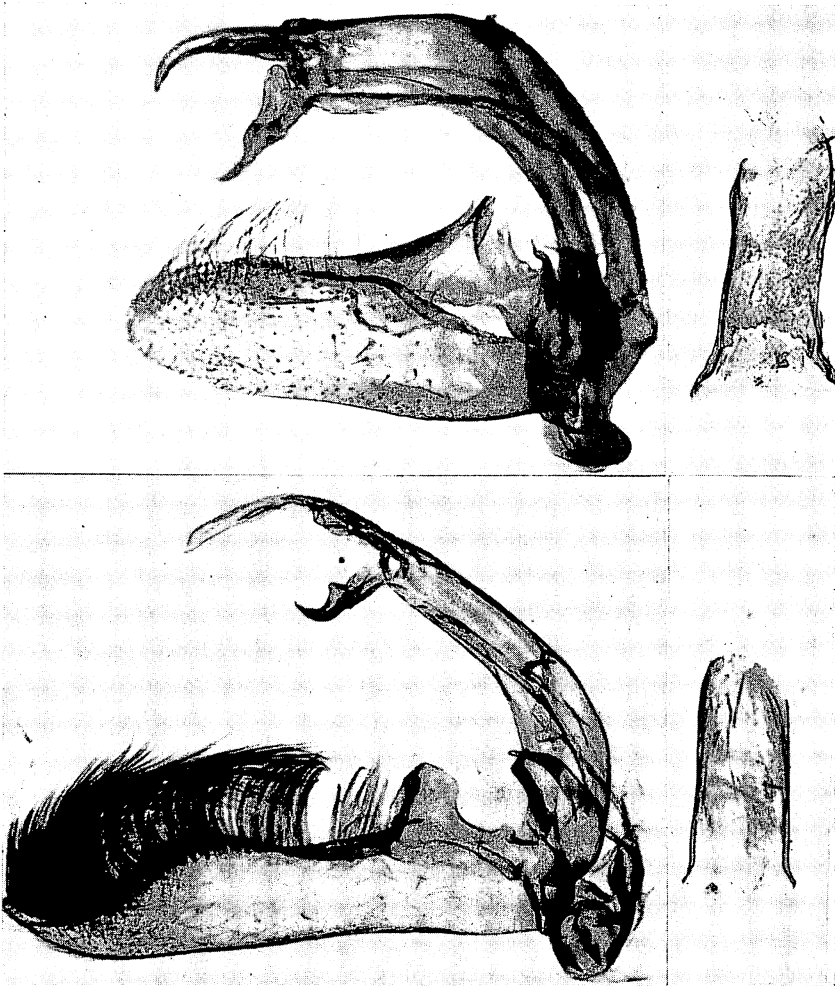


Figure 255—Lateral views of male genitalia of *Mestolobes*, right valves removed. Above: The type of *erinnys* Meyrick; Waianae Mts., Oahu, 2,200 feet. Below: The type of *eurylyca* Meyrick; Lanai, 2,000 feet.

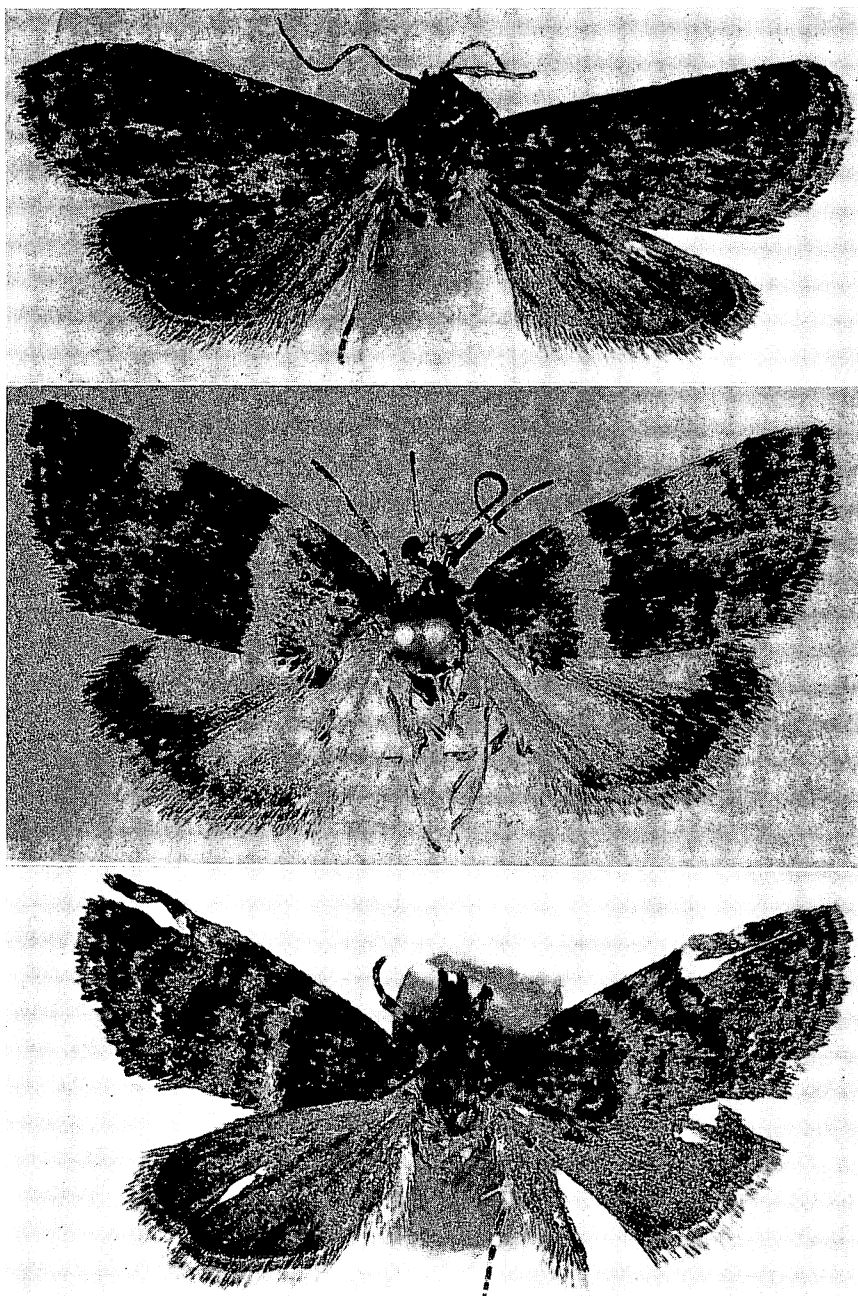


Figure 256—*Mestolobes*. Above: *iochrysa* Meyrick, female type; Waimea Mts., Kauai, 4,000 feet; expanse, 13 mm. Center: Male type of *mesacma* Meyrick; Molokai, 3,000 feet; expanse, 14.5 mm. Below: Female type of *minuscula* (Butler); "Hawaiian Islands 81.7 137" (or 184?) (Blackburn); expanse, 12.5 mm.

specimen of this moth from a whitish caterpillar he found among the roots of sugarcane on Oahu in 1930. This record is in error, and the insect involved was *Tamsica floricolans* (Butler).

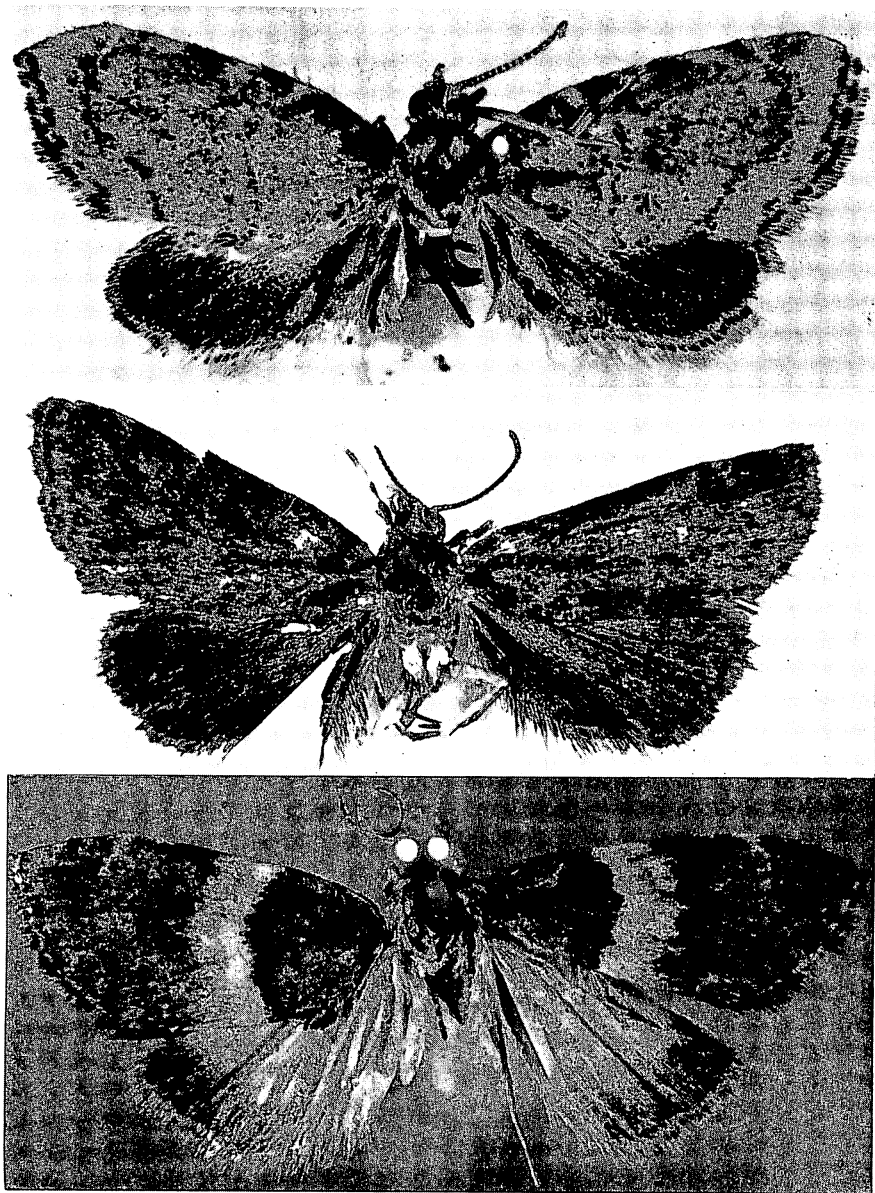


Figure 257—*Mestolobes*. Above: Male type of *ochrias* Meyrick; Waianae Mts., Oahu, 2,000 feet; expanse, 11 mm. Center: Female type of *ombrias* Meyrick; Molokai, above 3,000 feet; expanse, 14.5 mm. Below: Male type of *orthrias* Meyrick, male type; Waimea Mts., Kauai, 4,000 feet; expanse, 17.5 mm.

I believe that more than one species is involved in the series of specimens under this name.

Butler originally assigned the species to the family Hercynidae.

Perkins (1913:161) said that this species "is ubiquitous, occurring near the sea-shore even on the leeward side of the islands, and thence upwards through the forest-belt. Not infrequently a small swarm will buzz around and even settle upon the person of the collector."

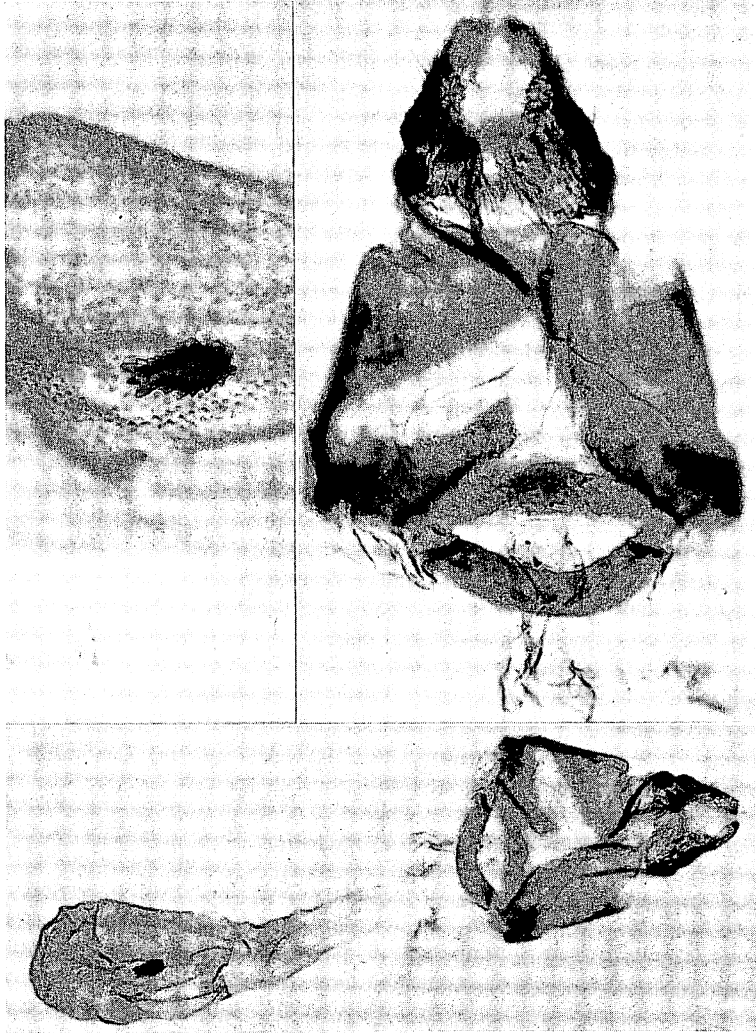


Figure 258—Female genitalia of the type of *Mestolobes iochrysa* Meyrick; Waimea Mts., Kauai, 4,000 feet; the peculiar paired sacs were unfortunately removed during dissection.

Mestolobes ochrias Meyrick (figs. 257, 261).*Mestolobes ochrias* Meyrick, 1899:234.

Endemic. Oahu (type locality: Waianae Mountains, 2,000 feet), Hawaii.

Hostplant: Unknown.

Meyrick did not mention that the yellow hairs on the tornal lobe are black tipped.

Mestolobes ombrias Meyrick (figs. 257, 261).*Mestolobes ombrias* Meyrick, 1899:233, pl. 6, fig. 15.

Endemic. Molokai (type locality: over 3,000 feet), Lanai.

Hostplant: Unknown.

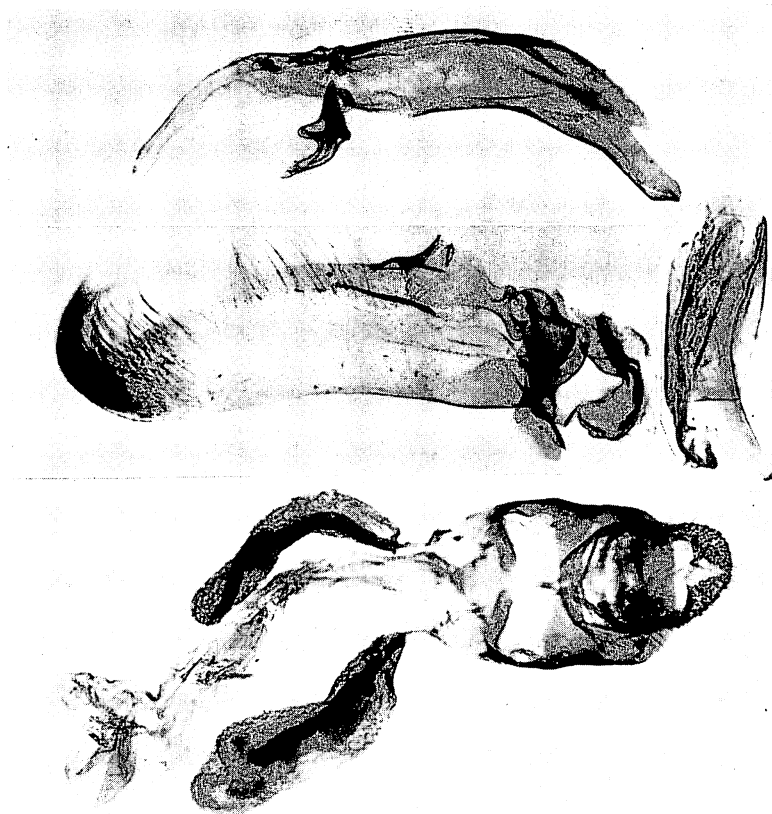


Figure 259—*Mestolobes minuscula* (Butler). Above: Male genitalia of the type of the synonym *simaethina* Butler; lateral view of tegumen, uncus, gnathus, a left valve and the aedeagus; "Hawaiian Is." (Blackburn). Below: The genitalia of the allotype female of the synonym *simaethina* Butler.

Mestolobes orthrias Meyrick (figs. 257, 261).

Mestolobes orthrias Meyrick, 1899:235, pl. 6, fig. 17.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

Mestolobes perixantha Meyrick (figs. 263, 266).

Mestolobes perixantha Meyrick, 1899:238, pl. 6, fig. 20.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

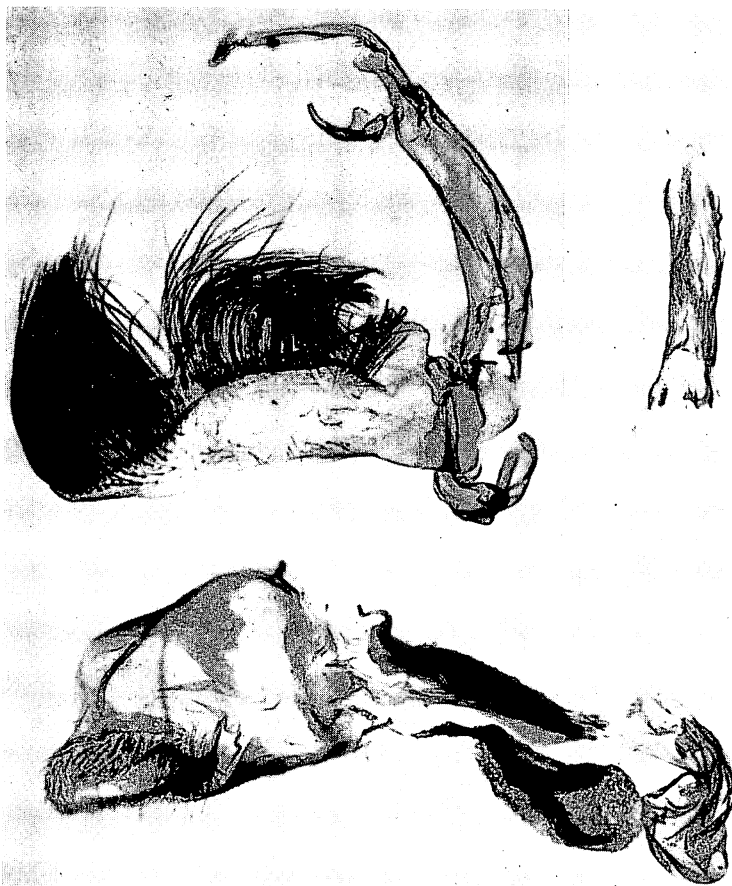


Figure 260—*Mestolobes*. Above: Lateral view of male genitalia of the type of *mesacma* Meyrick; Molokai Mts., 3,000 feet; right valve removed. Below: Female genitalia of the type of *minuscula* (Butler); Maui.

Mestolobes pessias Meyrick (figs. 262, 266).

Mestolobes pessias Meyrick, 1899:236, pl. 6, fig. 18.

Endemic. Maui (type locality: Haleakala, 5,000 feet).

Hostplant: Unknown.

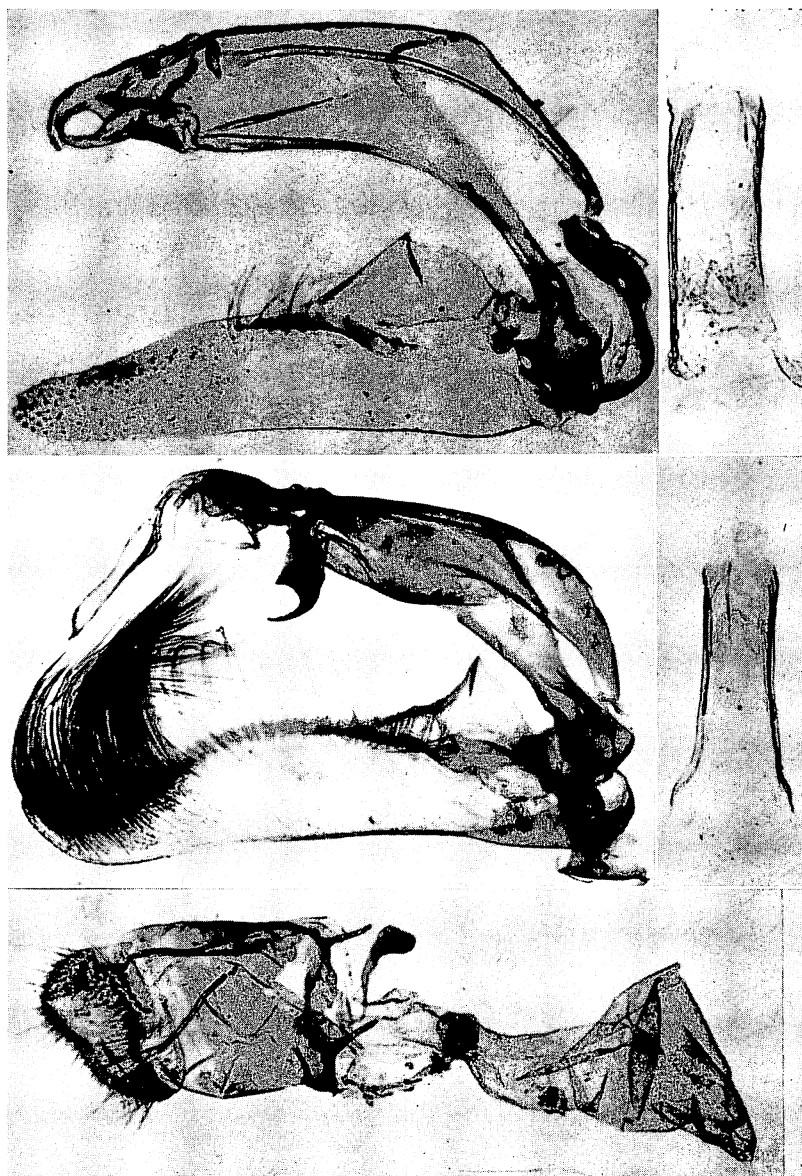


Figure 261—*Mestolobes*. Above: *ochrias* Meyrick; genitalia of the male type, lateral view, right valve removed. Center: The same of *orthrias* Meyrick, type; Waimea Mts., Kauai, 4,000 feet. Below: Female genitalia of *ombrias* Meyrick; a Molokai example.

Mestolobes pragmatica* Meyrick (figs. 264, 266).Mestolobes pragmatica* Meyrick, 1899:239.

Endemic. Hawaii (type locality: Olaa).

Hostplant: Unknown.

Mestolobes quadrifasciata* Swezey (fig. 267).Mestolobes quadrifasciata* Swezey, 1920:381.

Endemic. Oahu (type locality: Mount Olympus).

Hostplant: Unknown.

Dr. Swezey has told me that, although it is not mentioned in the description, there is no costal hair-pencil or tornal lobe on the hind wing of the male. Dr.



Figure 262—*Mestolobes pessias* Meyrick. Male genitalia, lateral view, right valve removed, of the type; Haleakala, Maui, 5,000 feet. Genitalia of a female; also from Maui.

Swezey found this species to be common in the southeast Koolau Mountains from 1908 to 1914, but in later years it was hardly ever seen and the last specimens collected by him were found in 1921.

Mestolobes scleropis Meyrick (figs. 265, 267).

Mestolobes scleropis Meyrick, 1899:234, pl. 6, fig. 16.

Endemic. Molokai (type locality: over 3,000 feet).

Hostplant: Unknown.

Mestolobes semiochrea Butler (figs. 267, 268).

Mestolobes semiochrea Butler, 1882:39. Meyrick, 1888:229; 1899:238; 1904:361.
Hampson, 1897:229.

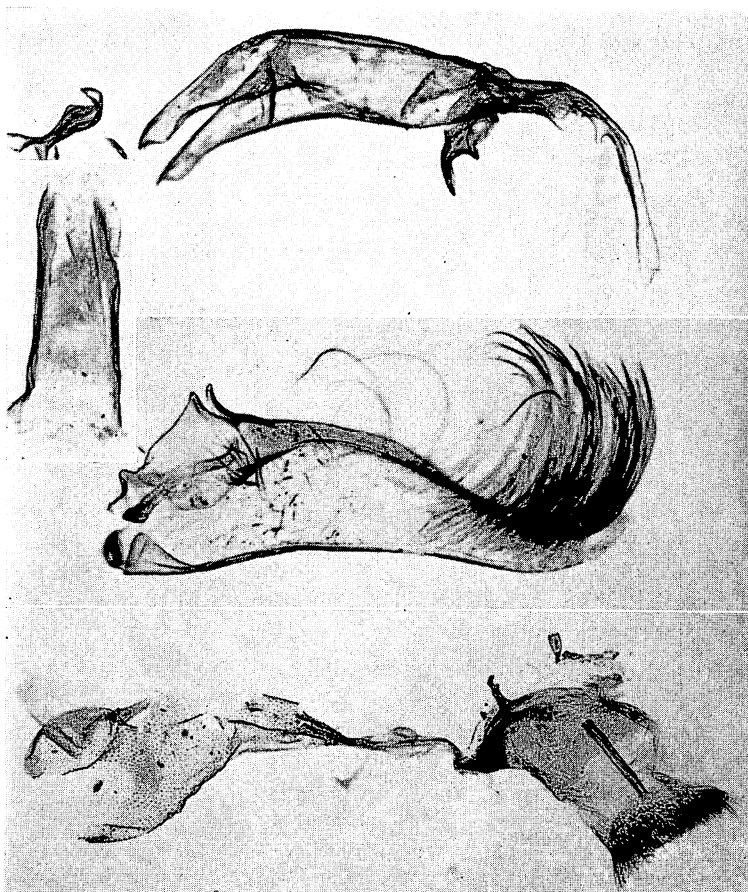


Figure 263—*Mestolobes perixantha* Meyrick. Above: Genitalia of the male type; lateral view of tegumen, uncus and gnathus, aedeagus and a right valve. Below: Genitalia of a female. Both from Kauai.

Endemic. Oahu (type locality: in the mountains near Honolulu).

Hostplant: Unknown. The moths have been taken while feeding on the blossoms of *Metrosideros*.

Mestolobes sicaria Meyrick (fig. 269).

Mestolobes sicaria Meyrick, 1904:131.

Endemic. Molokai (type locality: 4,000 feet).

Hostplant: Unknown.

Mestolobes sirina Meyrick (figs. 269, 271).

Mestolobes sirina Meyrick, 1899:231.

Endemic. Lanai (type locality: 3,000 feet).

Hostplant: Unknown.

Mestolobes xanthoscia Meyrick (figs. 269, 270).

Mestolobes xanthoscia Meyrick, 1899:230; 1904:133.

Endemic. Oahu, Molokai, Hawaii (type locality: Olaa).

Hostplant: Unknown. The adults have been seen visiting the flowers of *Metrosideros*.



Figure 264—*Mestolobes pragmatica* Meyrick. Lateral view of male genitalia, right valve removed, of a paratype from Olaa, Hawaii.

The holotype is a female, and the hind wing fringes are dark. The male dissected for studies and photographs of the genitalia is from Oahu and has the fringes of the hind wings white. Further checking should be made to ascertain if two species could possibly be involved here.

Subgenus **PROMYLAEA** (Meyrick, 1899:227), **new status**

This is only a slightly differentiated endemic *Mestolobes* stock. The type of the genus was described from a unique female. The two included species are not

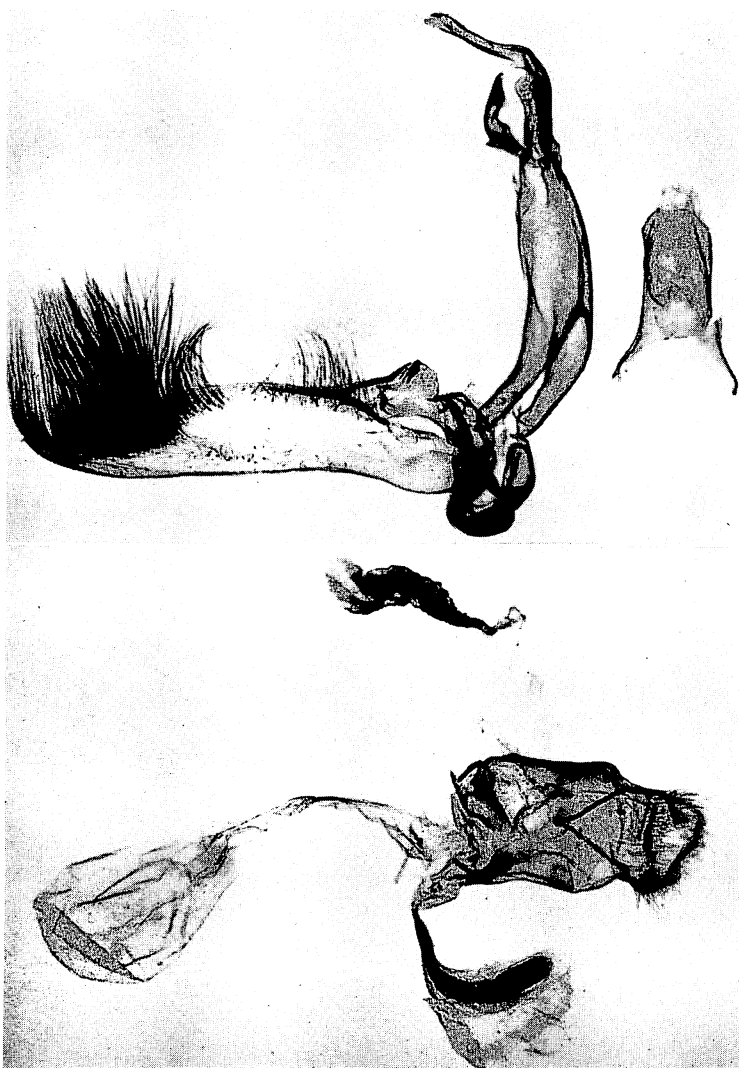


Figure 265—*Mestolobes scleropis* Meyrick. Male genitalia of the type; lateral view with right valve removed; Molokai Mts., over 3,000 feet. Female genitalia; also from Molokai.

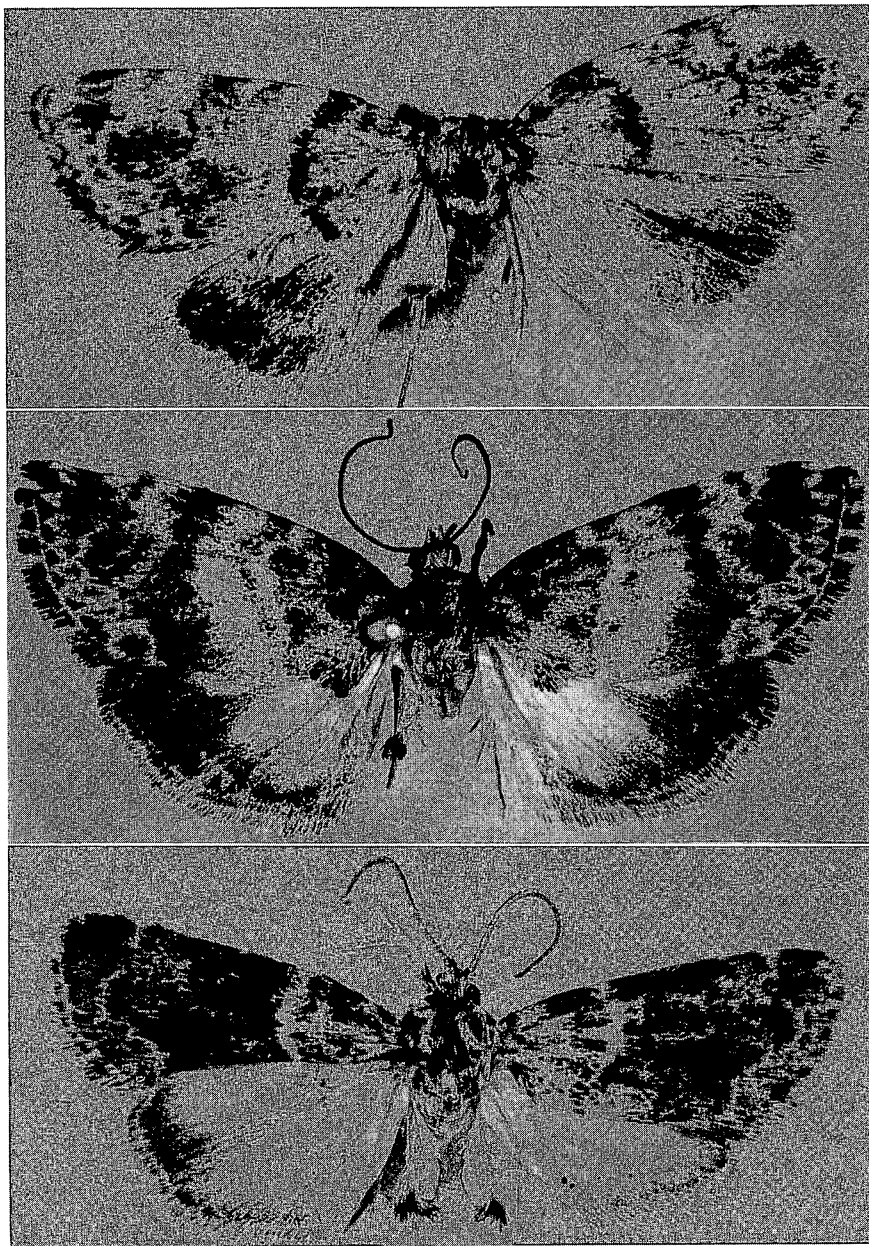


Figure 266—*Mestolobes*. Above: The male type of *perixantha* Meyrick; Waimea Mts., Kauai, 4,000 feet; expanse, 13 mm. Center: The male type of *pessias* Meyrick; Haleakala, Maui, 5,000 feet; expanse, 21.5 mm. Below: Paratype male of *pragmatika* Meyrick; Oloa, Hawaii; expanse, about 15 mm. (?).

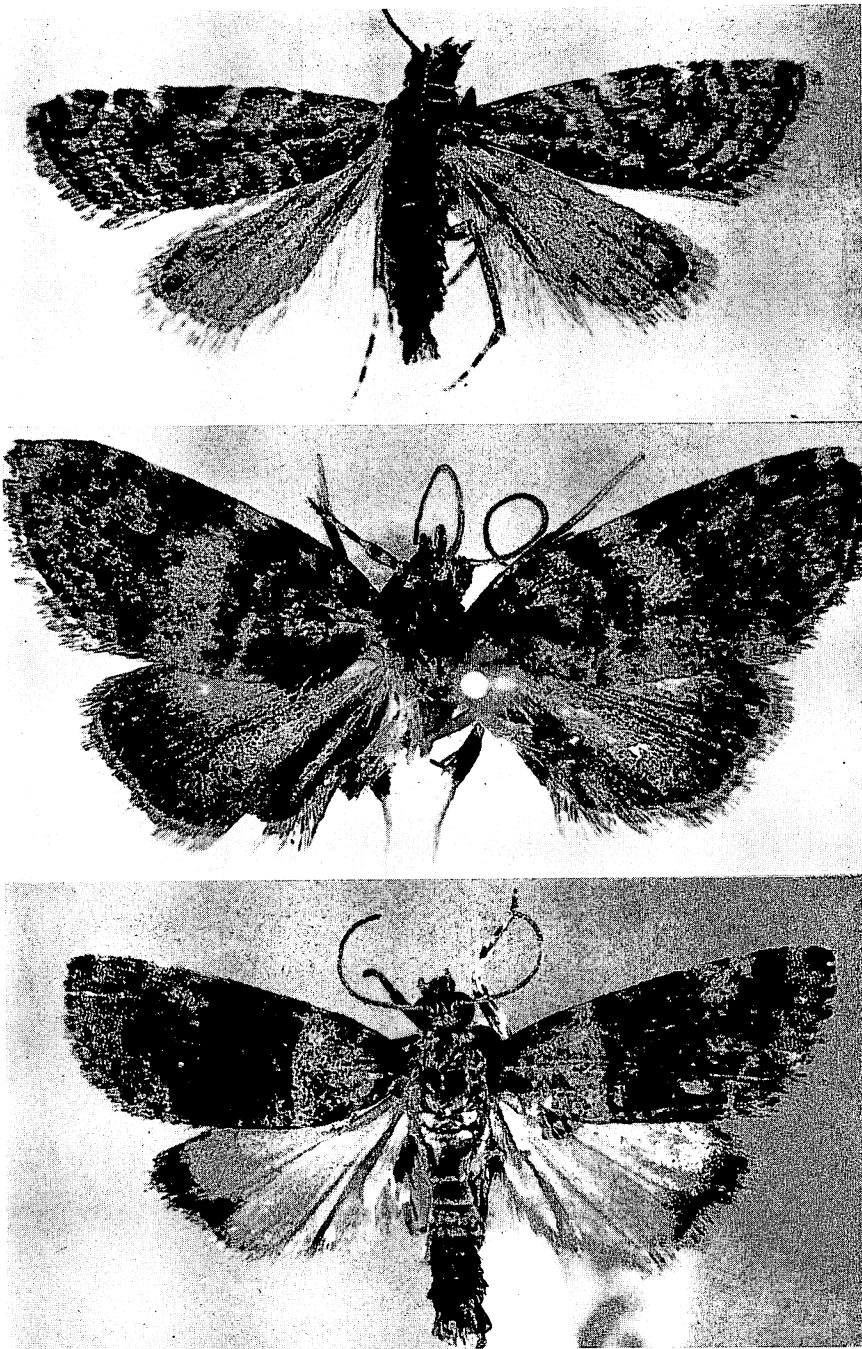


Figure 267—*Mestolobes*. Above: *quadrifasciata* Swezey. Center: *scleropis* Meyrick, male type; Molokai Mts., over 3,000 feet; expanse, 15.5 mm. Below: *semiochrea* Butler, male type; Honolulu, 1,300 feet; expanse, 14 mm.

monophyletic. The short maxillary palpi were given generic value by Meyrick, but they seem to be only of specific importance here. The hind wing of the male has the peculiar tornal lobe of *Mestolobes*, and the hind wing does not display generic differences as Meyrick thought that it might. If it were not for the fact that veins 4 and 5 in the hind wing diverge from their origins instead of being fused for some distance beyond the cell before forking (as in *Mestolobes*), I should place the species in *Mestolobes*. It may be found that the character is variable, and it may be best if the "genera" were completely merged. The type of the genus, *pyropa*, appears closely related to such species of *Mestolobes* as *chrysomolybda* and *chrysomolybdoides*, and it has typical *Mestolobes* genitalia. For the present we may retain *Promylaea* as a subgenus of *Mestolobes*.



Figure 268—*Mestolobes*. Above: Lateral view of the male genitalia, left valve removed, of the type of *semiochrea* Butler; "82-9 156" (Blackburn). Below: Female genitalia of the same species; Hawaii.

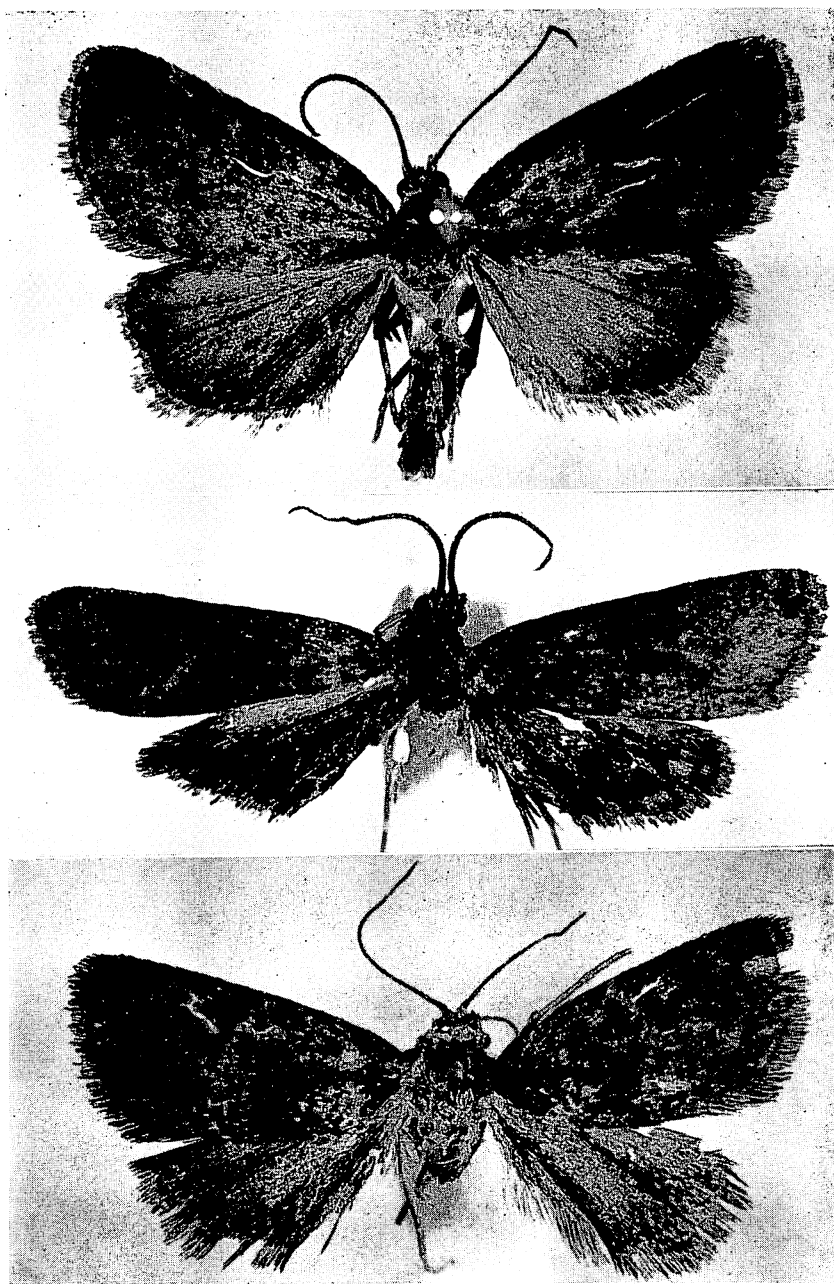


Figure 269—*Mestolobes*. Above: *sicaria* Meyrick; a male from Molokai, 4,000 feet; expanse, 19 mm. Center: The male type of *sirina* Meyrick; Lanai, 3,000 feet; expanse, 12.5 mm. Below: *xanthoscia* Meyrick, female type; O'ahu, Hawaii; expanse, 13.5 mm.

Unfortunately, the name *Promylaea* is easily confused with *Promylea* Ragonot, 1887, a phycitid.

KEY TO THE SPECIES OF PROMYLAEA

1. Black species with iridescent sheen and a sprinkling of whitish scales across middle part of fore wing; (fringes of wings black; palpi orange); Molokai. **pyropa** (Meyrick).
2. With four prominent, yellow, transverse bands across fore wings, scaling between these bands and on hind wings pale fuscous; Alakai Swamp, Kauai. . . . **quadrifascia** (Swezey).

Mestolobes (*Promylaea*) pyropa (Meyrick), **new combination** (figs. 272, 273). Type of *Promylaea*.

Promylaea pyropa Meyrick, 1899:227, pl. 6, fig. 9.

Promylaea pyropae Klima, 1937:55, misspelling.

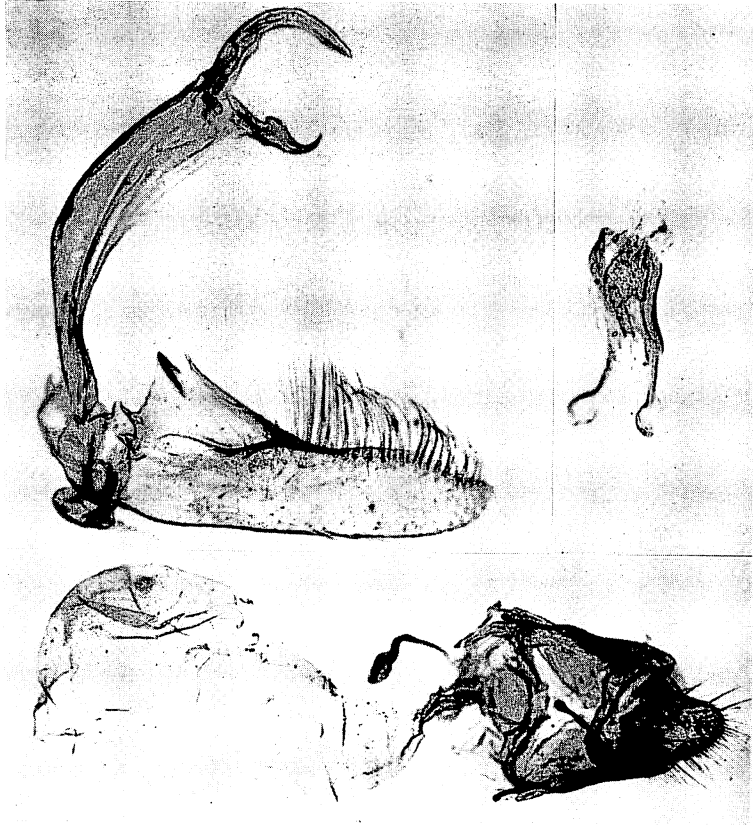


Figure 270—*Mestolobes xanthoscia* Meyrick. Above: Lateral view of male genitalia, left valve removed; Honolulu, 1,500 feet. Below: The genitalia of the female type; Hawaii.

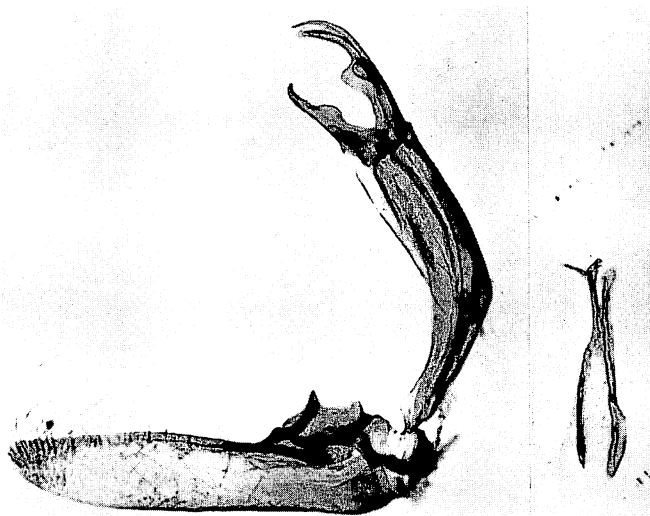


Figure 271—*Mestolobes sirina* Meyrick, type; lateral view of male genitalia with right valve removed.

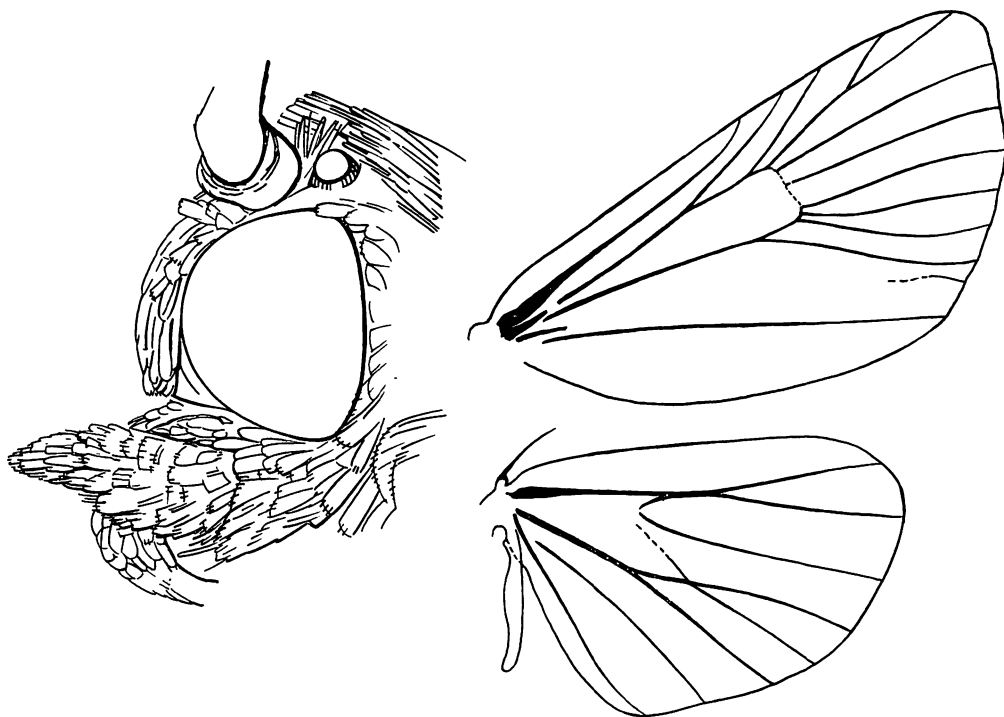


Figure 272—Head of *Mestolobes (Promylaea) pyropha* (Meyrick) and wing venation of *Promylaea* species.

Endemic. Oahu ?, Molokai (type locality: over 4,000 feet).

Hostplants: *Peperomia*, *Peperomia pachyphylla*; the adults have been taken at *Hoya* flowers. (These records may not belong to this species.)

There is, I believe, considerable confusion in collections under this name, and

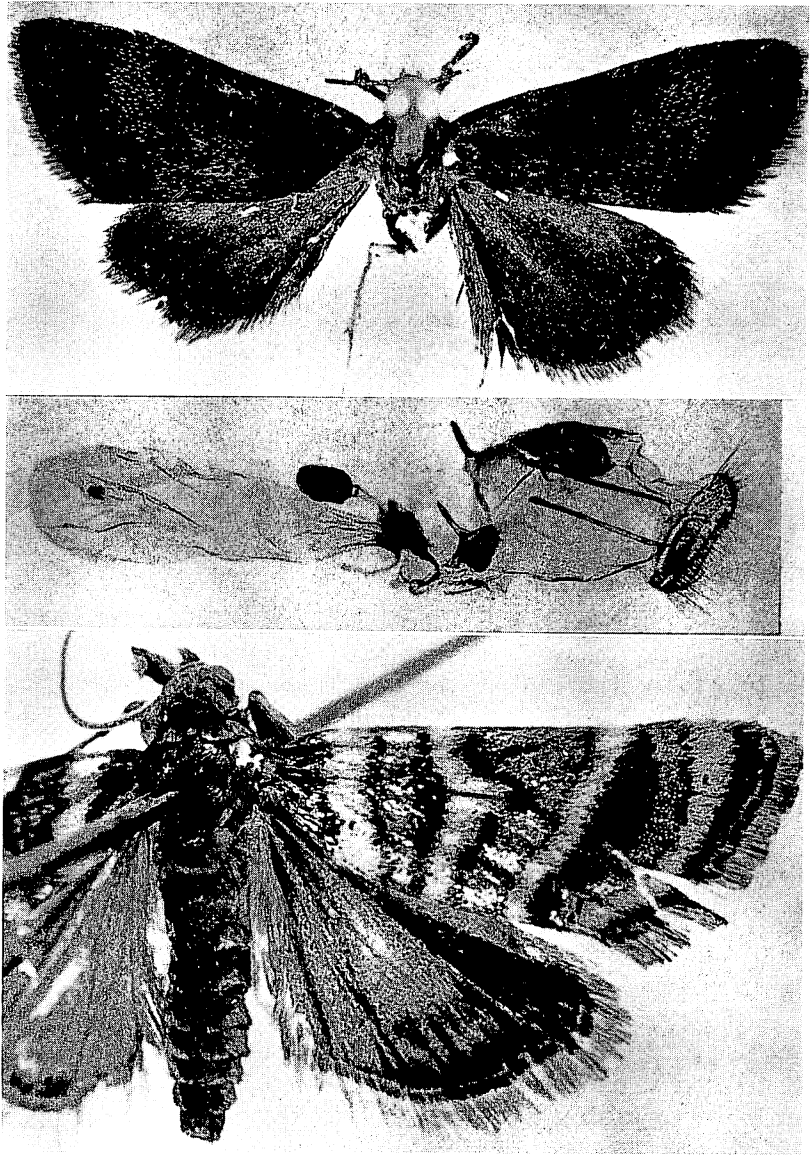


Figure 273—*Mestolobes* (*Promylaea*). Above: The female type of *pyropa* (Meyrick) and its genitalia; Molokai Mts., above 4,000 feet; expanse, 18 mm. Below: The type of *quadrifascia* (Swezey); Alakai Swamp, Kauai; fore wing 8 mm. long. (Note resemblance to *Mestolobes quadrifasciata* Swezey, fig. 267.)

the Oahu records and the rearing and host records may belong to another species or more than one other species. A specimen has also been found in the Kohala Mountains of Hawaii, and it probably represents another species.

Dr. Swezey has made the interesting discovery that what he has determined as this species on Oahu is a leafminer in *Peperomia*. He has told me that, although the *Peperomia* leaves are thick, one leaf does not provide enough food for the plump caterpillar. He found that after consuming all of the mesophyll of one leaf, the larva breaks through the epidermis and eats its way into another leaf to finish its growth, and a third leaf may also be attacked. Thus, he found that the caterpillar differs from most leafminers, which remain in a single leaf while getting their growth.

Mestolobes (Promylaea) quadrifascia (Swezey), **new combination** (fig. 273).

Promylaea quadrifascia Swezey, 1934:523.

Endemic. Kauai (type locality: Alakai Swamp, about 4,000 feet).

Hostplant: Unknown.

Nothing is known concerning the habits of this species, which was discovered by Dr. Swezey. It is known only from the type series of six examples collected as they were flying over stunted *Metrosideros* and other plants in a bog. Dr. Swezey thought that it also might be a *Peperomia* leafminer, but I believe that its habits might be quite different, because it is so distinct as an adult from *pyropa*. It appears not closely related to *pyropa*.

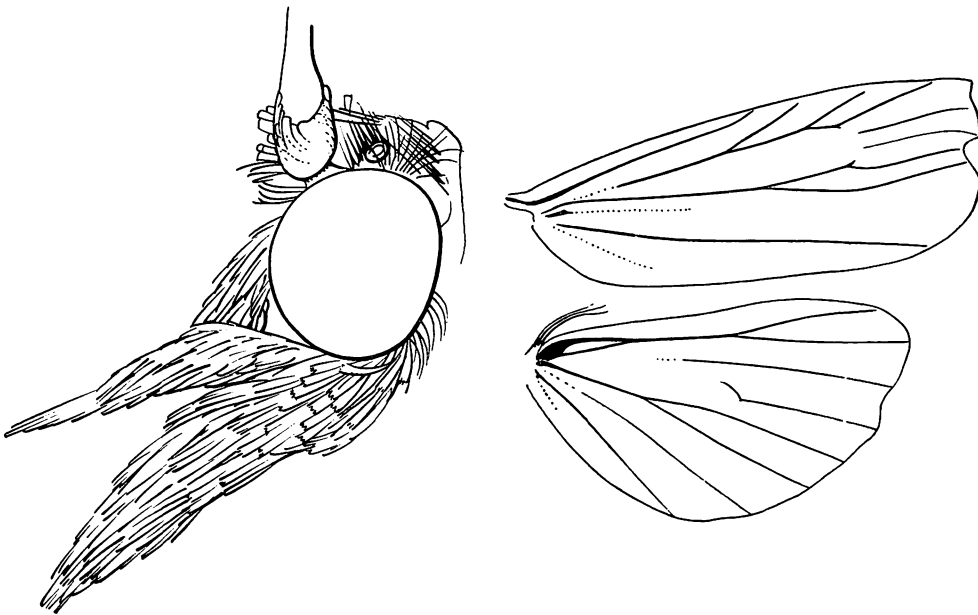


Figure 274—Head and wing venation of the female type of *Tulla exonoma* (Meyrick).

Genus **TULLA**, new genus

Head with mostly long, narrow scales; frons gently convex; palpi as illustrated, drooping; maxillary palpi nearly as long as labial palpi and as long or somewhat longer than the head; labial palpi longer than the head; proboscis developed. Antennae somewhat more than one-half as long as a fore wing, shortly pilose beneath. Structure of legs unknown (missing from type). Fore wing broadly

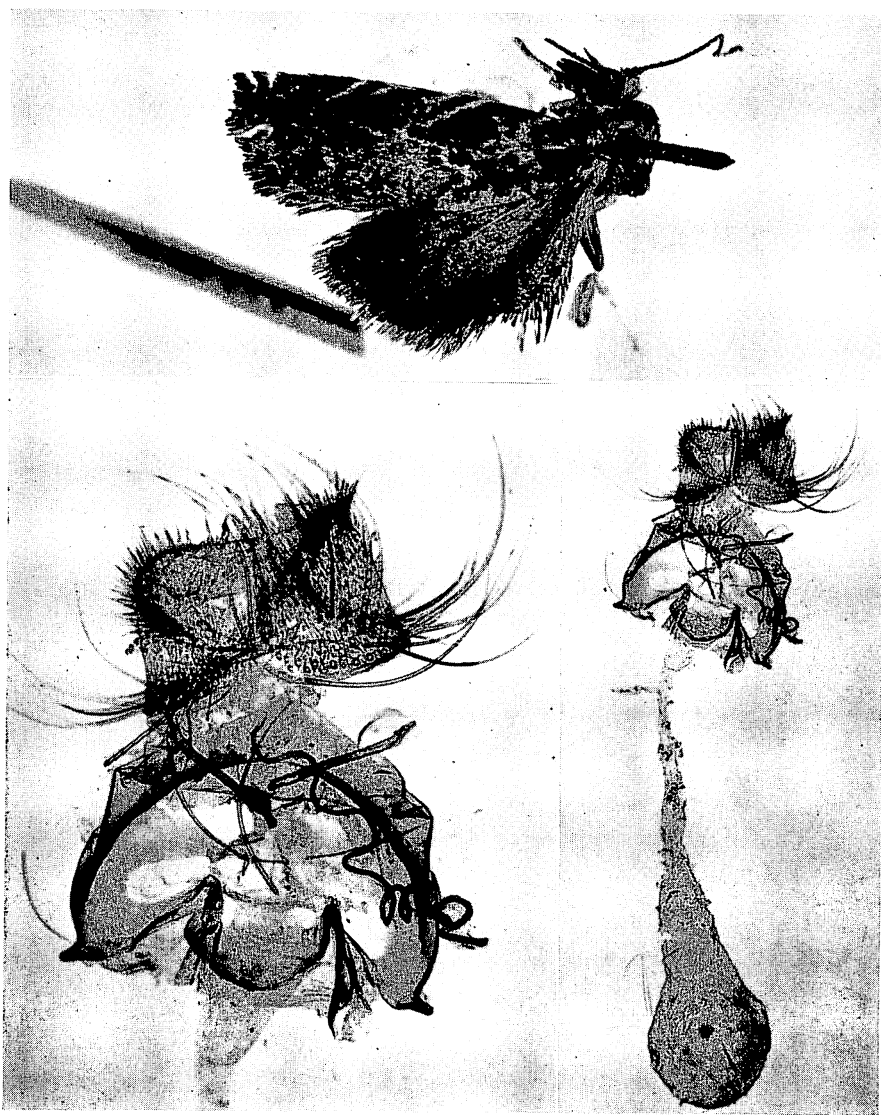


Figure 275—The unique female type of *Tulla exonoma* (Meyrick) and its genitalia; Waianae Mts., Oahu, 2,000 feet; wing 5.5 mm. long.

subtruncate apically and with a peculiar notch, as illustrated, and with veins 4 and 5 fused and 7, 8 and 9 fused, so that there are only nine veins present, as illustrated; hind wings with venation as illustrated, veins 4 and 5 fused. Male unknown; female genitalia as illustrated.

Type: *Prionoptyx exonoma* Meyrick. Gender of *Tulla*: feminine.

This new genus is erected to receive a peculiar little moth which is known only from the female holotype in the British Museum. The notch in the termen will separate it immediately from all other Hawaiian moths. It does not belong to *Prionoptyx* Stephens, 1834:316 (type: *nebulifera* Stephens from the Southern United States) where Meyrick placed it. Meyrick (1899:198) stated "Distinct by the small size and peculiar neuration (which varies specifically in this genus); in the later character it approaches nearest the Australian *P. epicistrigella*, to which, however, in other respects it is but little allied," but these comments are largely meaningless. Hampson (1895:963) placed *epicistrigella* in *Mesolia*. Our species does not belong to *Mesolia*.

The type somewhat resembles certain species of *Mestolobes*, such as *banausa*, and it is possible that the genus is in some way related to *Mestolobes*, but the material available is too meager to enable one to draw a conclusion. It is possible that the female genitalia have been damaged by dissection. It is extraordinarily similar in wing shape and pattern to certain undetermined Queensland Tortricidae which I have examined at the British Museum, but, of course, it is not a tortricid. It perhaps most resembles, although it may not be related to, *Diptychophora* Zeller, which has species in Samoa, Fiji, Australia and on to India; but the venation is quite distinct. We must await the collection of additional specimens before a conclusion may be drawn.

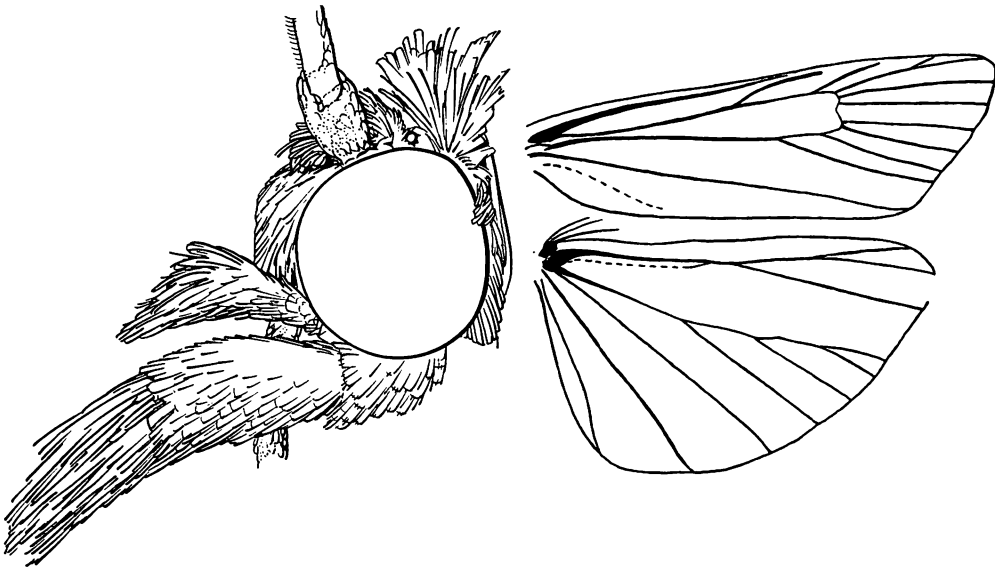


Figure 276—*Euchromius ocellus* (Haworth). Head and wing venation.

Tulla exonoma (Meyrick), **new combination** (figs. 274, 275).

Prionoptyx exonoma Meyrick, 1899:198, pl. 5, fig. 13.

Endemic. Oahu (type locality: Waianae Mountains, 2,000 feet).

Hostplant: Unknown.

Meyrick's figure of this species in *Fauna Hawaiensis* is rather poor and misleading.

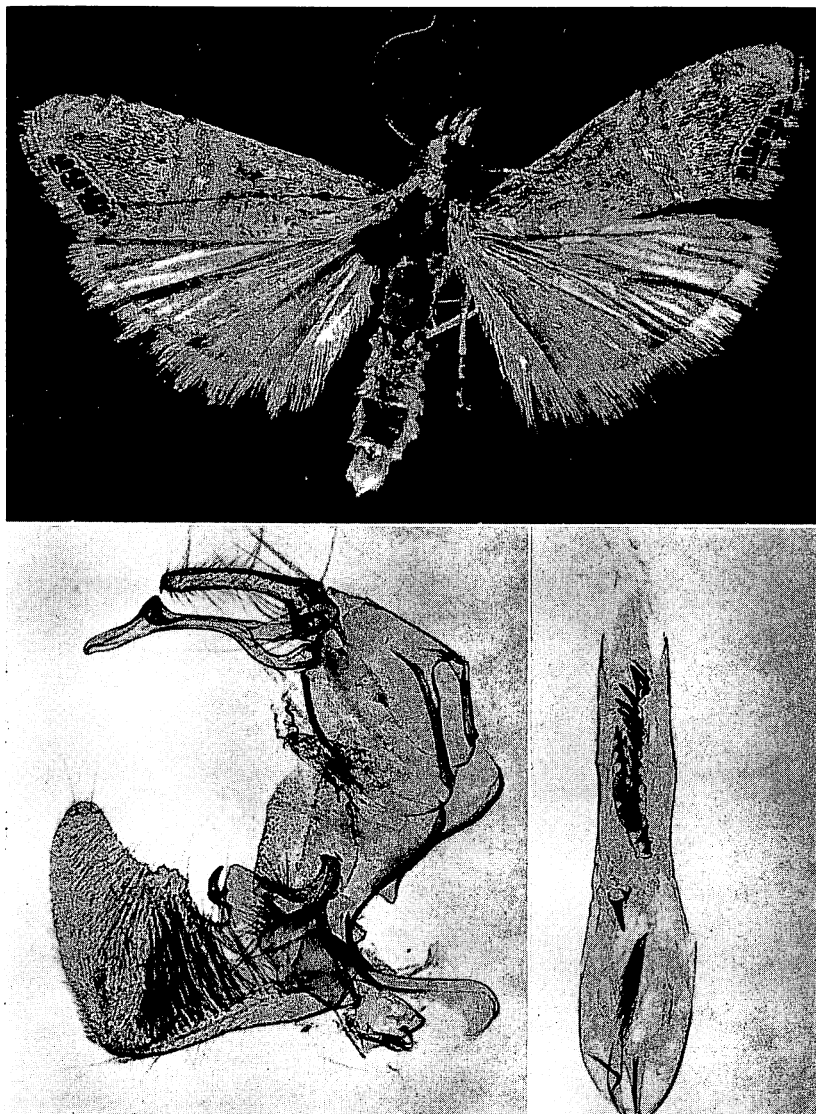


Figure 277—*Euchromius ocelleus* (Haworth); Waipio, Oahu; length of a fore wing, 9 mm. Below: Male genitalia, lateral view, one valve removed; probably from India.

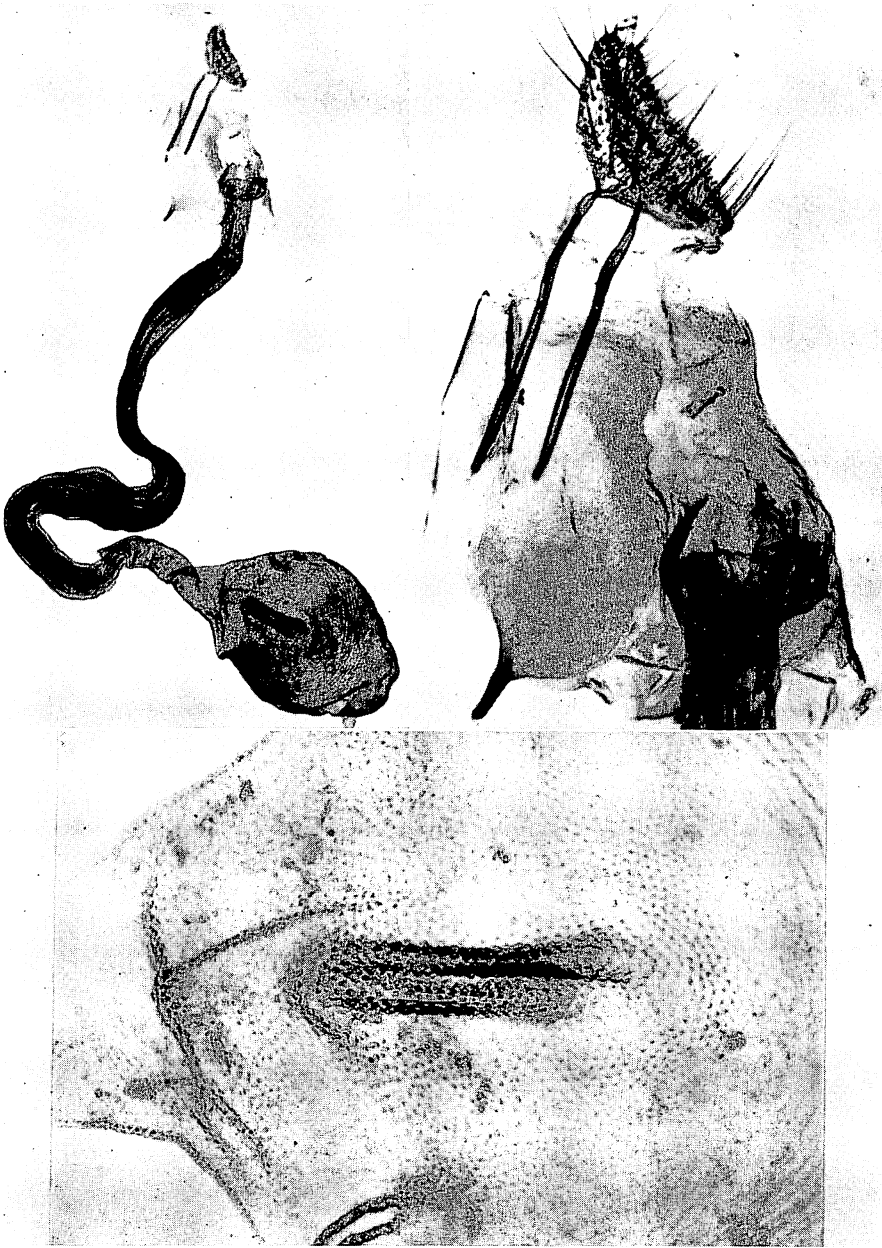


Figure 278—*Euchromius ocellus* (Haworth). Female genitalia; India.

Genus **EUCHROMIUS** Guenée, 1845:324

Eromene Huebner, 1825:366, not Huebner, 1821.

Ommatopteryx Kirby, 1897:274.

Euchromius ocellus (Haworth) (figs. 276, 277, 278).

Palparia ocellus Haworth, 1811:486.

Eromene bella, misidentification by Butler, 1882:42.

Euchromius ocellus (Haworth) Meyrick, 1895:396; 1899:197; 1904:356. Fernald, 1896:69, pl. 5, figs. 13, 14. Corbet and Tams, 1943:129, fig. 1; 1943:72, figs. 24, 77, 124, 161.

The necklace veneer (the common name in Britain).

Kauai, Niihau, Oahu, Molokai.

Immigrant; a widespread species. First reported from Hawaii by Butler (1882:42) from two examples collected by Blackburn at Honolulu.

Hostplant: The larval habits and food are unknown. "We have seen it flying in numbers in the daytime amongst grass and *Sida rhombifolia* on Molokai at elevations below 1,000 ft. during the cooler months of the year." (Perkins, 1913: clvii.)

See Corbet and Tams (1943:129) for distinctions between this species and *californicalis* (Packard).

Genus **CHILO** Zincken, 1817

This widespread genus has habits similar to those of *Diatraea* and largely replaces it in the Old World. It contains a number of species of economic importance. *Chilo* has prominent ocelli, but these organs are not present on *Diatraea*. For description, discussion and key to species, see Kapur (1950:394).

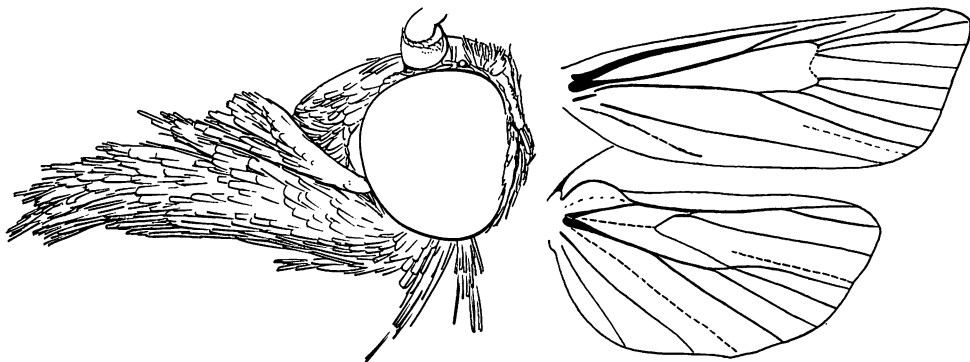


Figure 279—Head and wing venation of *Chilo suppressalis* (Walker).

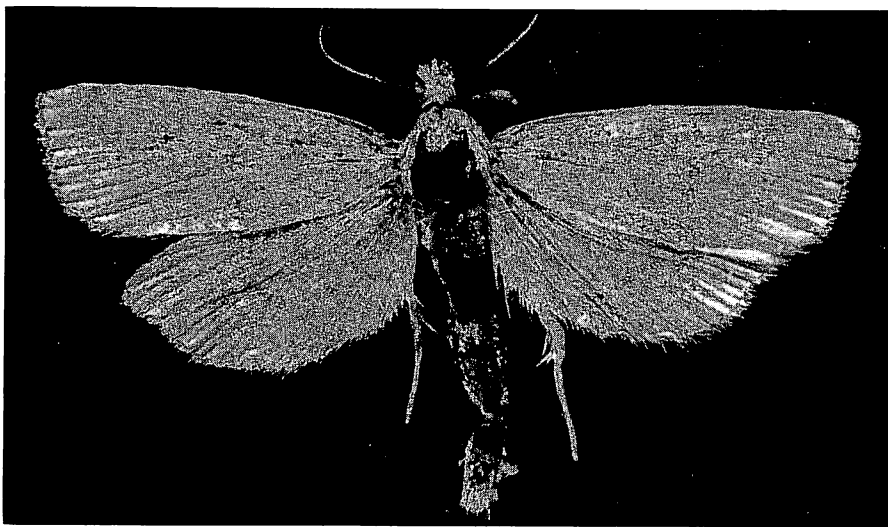


Figure 280—*Chilo suppressalis* (Walker); Waipa, Kauai; length of a fore wing, 8.75 mm.; reared from rice. Many specimens have the dark dots along the ends of the fore wings more evident than in this example.

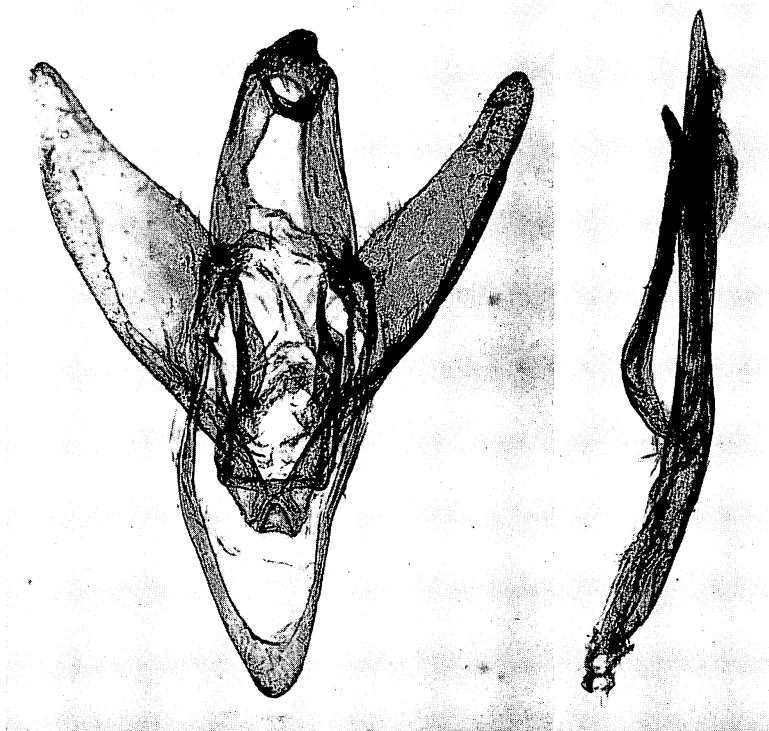


Figure 281—*Chilo suppressalis* (Walker). Male genitalia of the type of the synonym, *Chilo simplex* (Butler); Formosa.

Chilo suppressalis (Walker) (figs. 279, 280, 281).*Crambus suppressalis* Walker, 1863:166.*Chilo suppressalis* (Walker) Hampson, 1895:957; 1896:27. Kapur, 1950:397, pl. 2, fig. 2, pl. 3, figs. 1, 6, 7, 12, 13.*Jartheza simplex* Butler, 1880:690.*Chilo simplex* (Butler) Hampson, 1895:957; 1896:26. Synonymy by Vinson, 1942:40. Fletcher, 1914:422, figs. 299–300.*Chilo oryzae* Fletcher, 1928:59.

The Asiatic rice borer.

Kauai, Oahu.

Immigrant. A widespread species in India, China, eastern Asia, Japan, Formosa, Malaysia into the Pacific. The work of this species was first noticed in Hawaii near Honolulu in 1927, and an inspection of rice fields in 1928 showed that it was widespread over an area of 1,500 to 2,000 acres.

Hostplants: *Chaetochloa verticellata*, *Echinochloa crusgalli cruspavonis*, *Echinochloa stagnina*, *Eleusine indica*, *Panicum barbinode*, *Paspalum conjugatum*, rice.

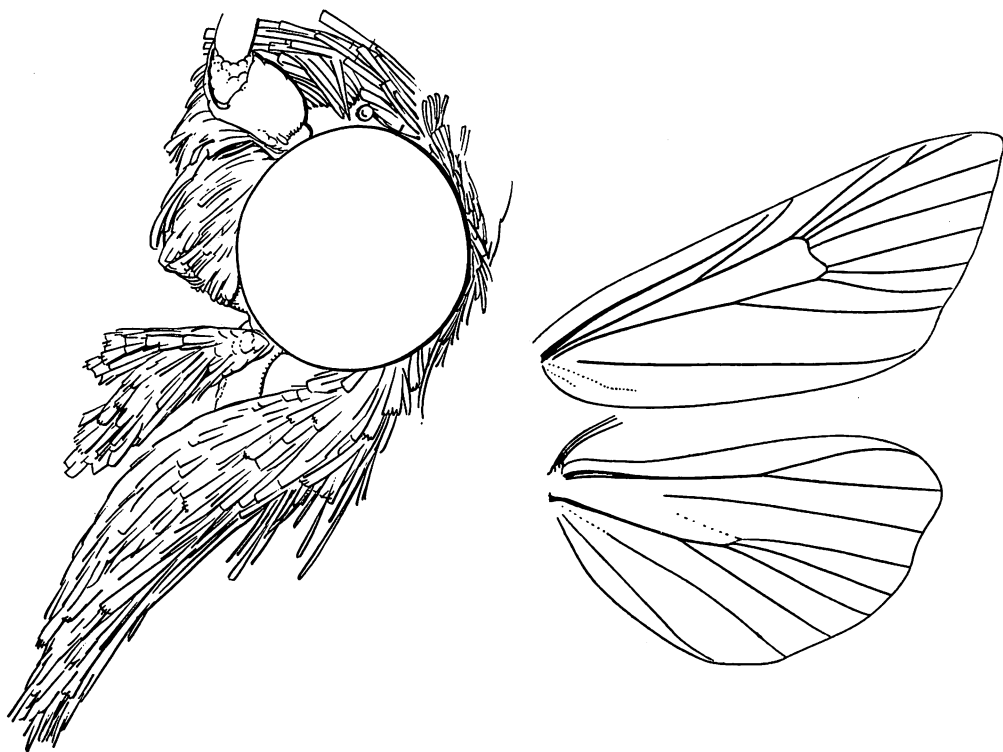


Figure 282—Head of *Tamsica floricolans* (Butler) and wing venation of *hydrophila* (Butler).

Parasites: *Horogenes chilonis* (Cushman), *Nesopimpla naranyae* Ashmead, *Neotrichogramma japonicum* (Ashmead), *Trichogramma minutum* Riley, *Zaleptopygus flavo-orbitalis* (Cameron).

This moth is a serious pest of rice, and it is largely responsible for the great reduction in the rice growing acreage in Hawaii. Between rice crops, the grass *Echinochloa crusgalli cruspavonis* serves as the principal host of the moth and is frequently killed by the caterpillars. For discussion and bibliography, see Kapur (1950:397).

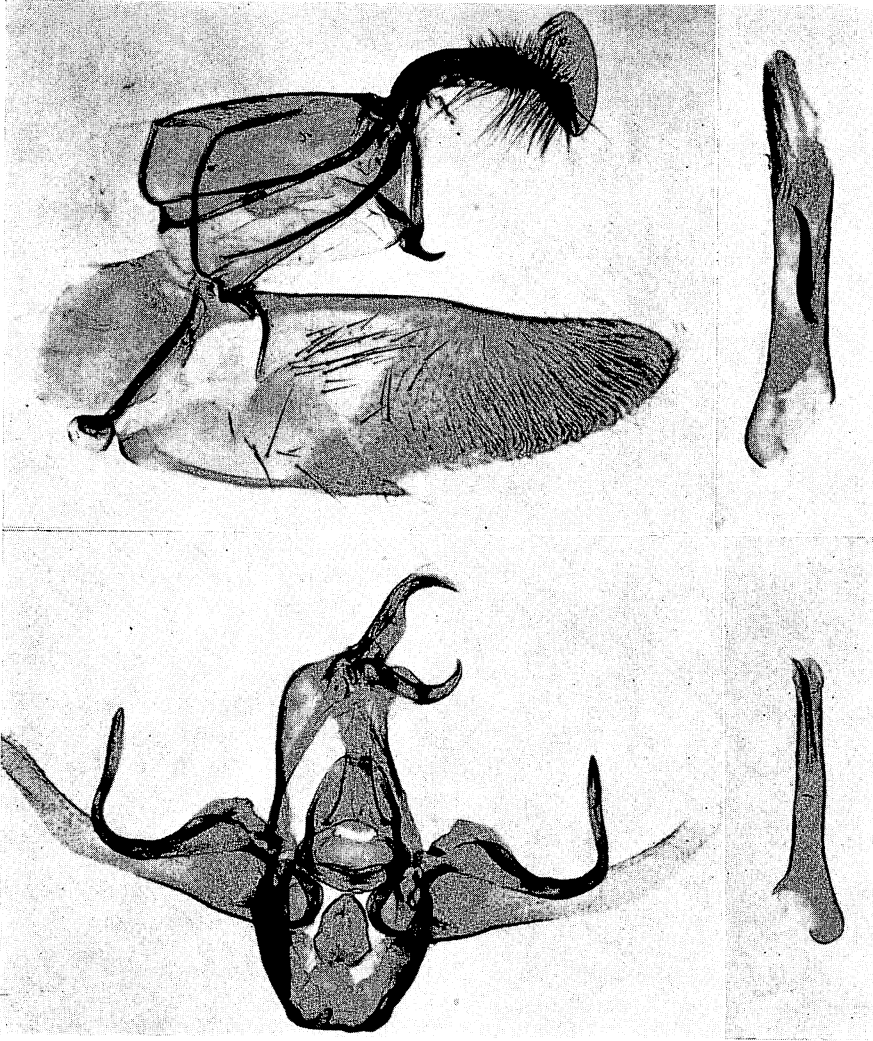


Figure 283—Above: The male genitalia of *Talis quercella* (Denis and Schiffermueller), the type of the genera *Talis* and *Prosmixis*; a specimen from the Zeller collection, Europe; the bulbous tuberosity on the uncus is sclerotized and not membranous. Below: Male genitalia of *Hednota bifractella* Walker; England; the type of the genus *Hednota*. These figures are given here to support my conclusion that neither *Talis* (= *Prosmixis*) or *Hednota* occurs in Hawaii. Compare these figures with the figures of the genitalia of *Tamsica*.

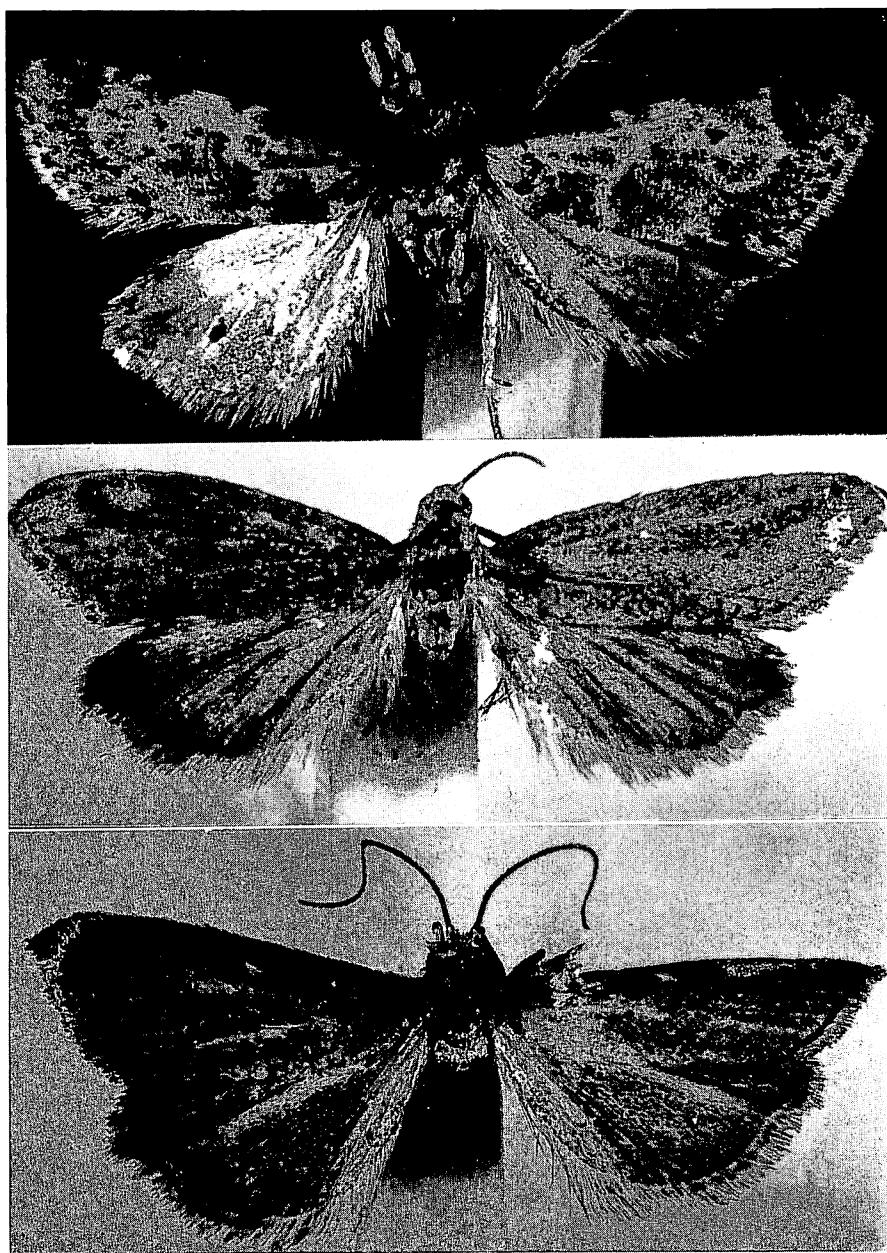


Figure 284—*Tamsica*. Above: The male type of *floricolans* (Butler); "Hawaiian Isl. 82-98" (Blackburn); expanse, 14 mm.; the black spot on the left hand wing is dirt. Center: *geralea* (Meyrick), type male; Waimea Mts., Kauai, 4,000 feet; expanse, 15.5 mm. Below: The male type of *homodora* (Meyrick); Waianae Mts., Oahu, 3,000 feet; expanse, 14 mm.; the right wing is broken and bent ventrad at the costal margin. These photographs may make the moths appear too dark.

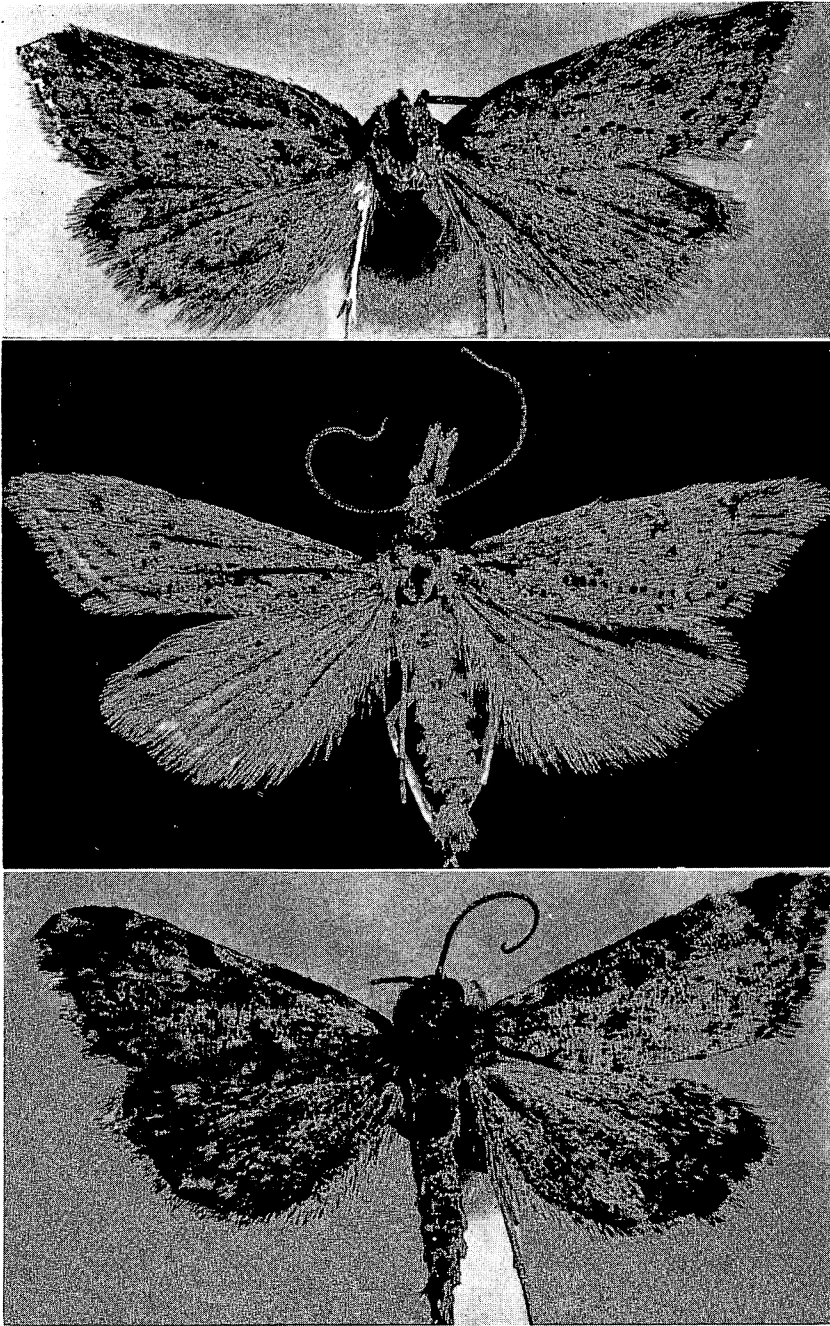


Figure 285—*Tamsica*. Above: The male type of *hyacinthina* (Meyrick); Kona, Hawaii, 4,000 feet; expanse, 14.5 mm. Center: A specimen of the same species reared from a pupa found among the roots of dead grass by Dr. Swezey, Diamond Head, Honolulu; length of a fore wing, 5.75 mm.; the pattern is variable. Below: An example of *hydropfila* (Butler); northwest Koolau Mts., Oahu, 500 feet; the type of this species is in too poor condition to furnish an adequate photograph.

Genus **TAMSICA**, new genus

Head with long, broad scales; frons strongly tumid, smooth-scaled; labial palpi as illustrated, drooping or semi-porrect, longer than head, specifically variable in length; maxillary palpi about half as long as labial palpi, and somewhat longer than the diameter of an eye, as illustrated; proboscis well developed. Antennae about two-thirds the length of a fore wing, shortly pilose beneath, broader and more extensively and conspicuously pilose beneath in male. Hind femora subequal in length to tarsus, with the "medial" spurs only slightly farther from terminal spurs than the length of longest "medial" spur, differences in lengths of the four spurs slight; first hind tarsal segment subequal in length to segments 2 plus 3.

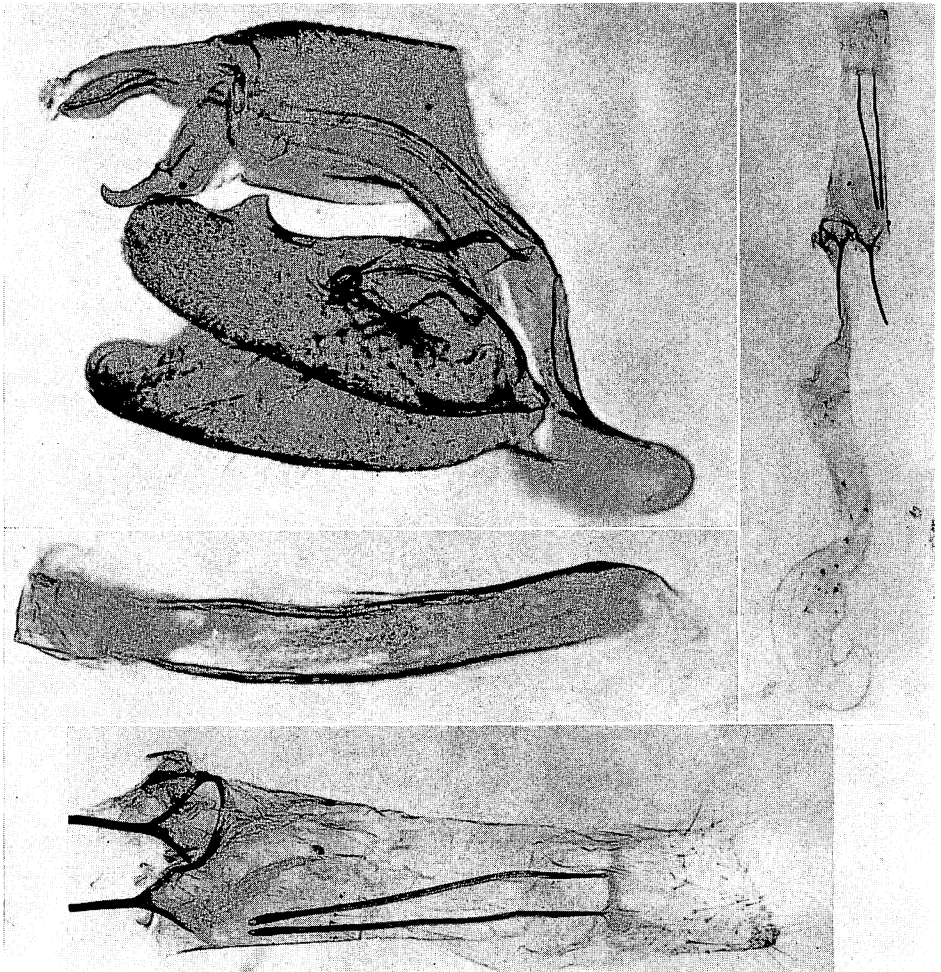


Figure 286—*Tamsica floricolans* (Butler). Male genitalia of the type; Lanai. Female genitalia from a Molokai specimen.

Fore wings pointed; venation of fore and hind wings as illustrated. Genitalia as illustrated.

Type: *Talis floricolans* (Butler) Meyrick, 1899:200. Gender of *Tamsica*: feminine.

This is a cluster of poorly understood, obscure, difficult little species. They appeared in *Fauna Hawaiiensis* under *Talis* and have been placed in *Prosmixis* in some collections, including those arranged by Hampson in the British Museum. (*Talis* Guenée, 1845:324, type *quercella* Denis and Schiffermueller = *Prosmixis* Zeller, 1846:270, type *quercella* Denis and Schiffermueller.) Hampson (1895: 967–968) gave a confusing summary of the group. Meyrick (1888: 242–243) placed the species in *Hednota* Meyrick, 1886. Hampson listed *Hednota* as a synonym of his "Section I" of *Talis* and placed the Hawaiian species there. I have checked the genitalia of the type of *Hednota* (*bifractella* Walker), and I find that it is a

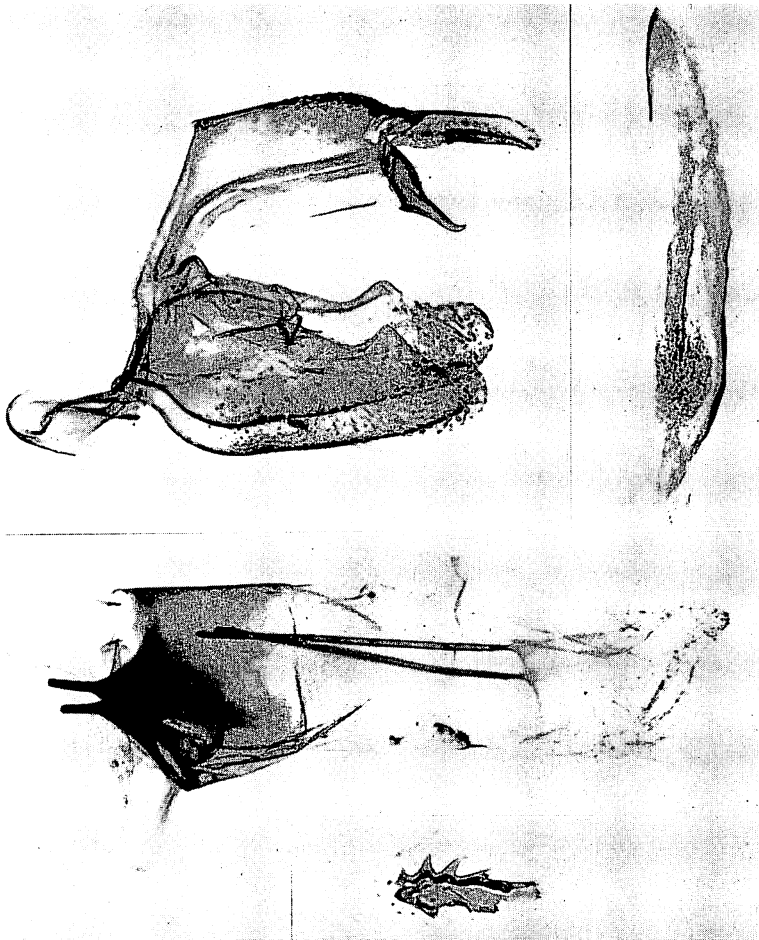


Figure 287—*Tamsica homodora* (Meyrick). Above: Lateral view of male genitalia of the type; Oahu. Below: Part of the genitalia of a female with an insert figure of the signum.

good and distinct genus. It is obviously different from the type of *Talis* and the Hawaiian group. *Talis* (or *Prosmixis*), as it now stands, is an artificial assemblage of several distinct genera and obviously in need of revision. I have been unable

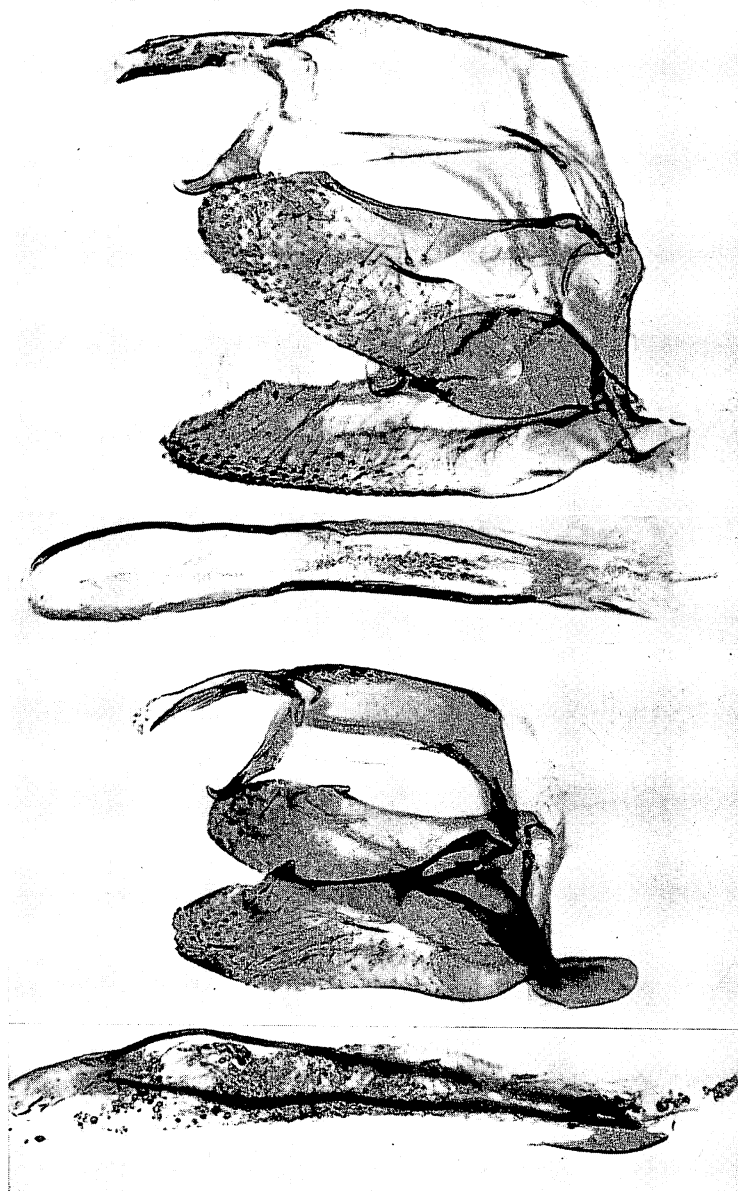


Figure 288—*Tamsica*. Above: Male genitalia of *hyacinthina* (Meyrick), male; Kona, Hawaii; apex of left valve damaged. Below: The male genitalia of the type of *hydrophila* (Butler); "Hawaiian Islands 82-9 163" (Blackburn).

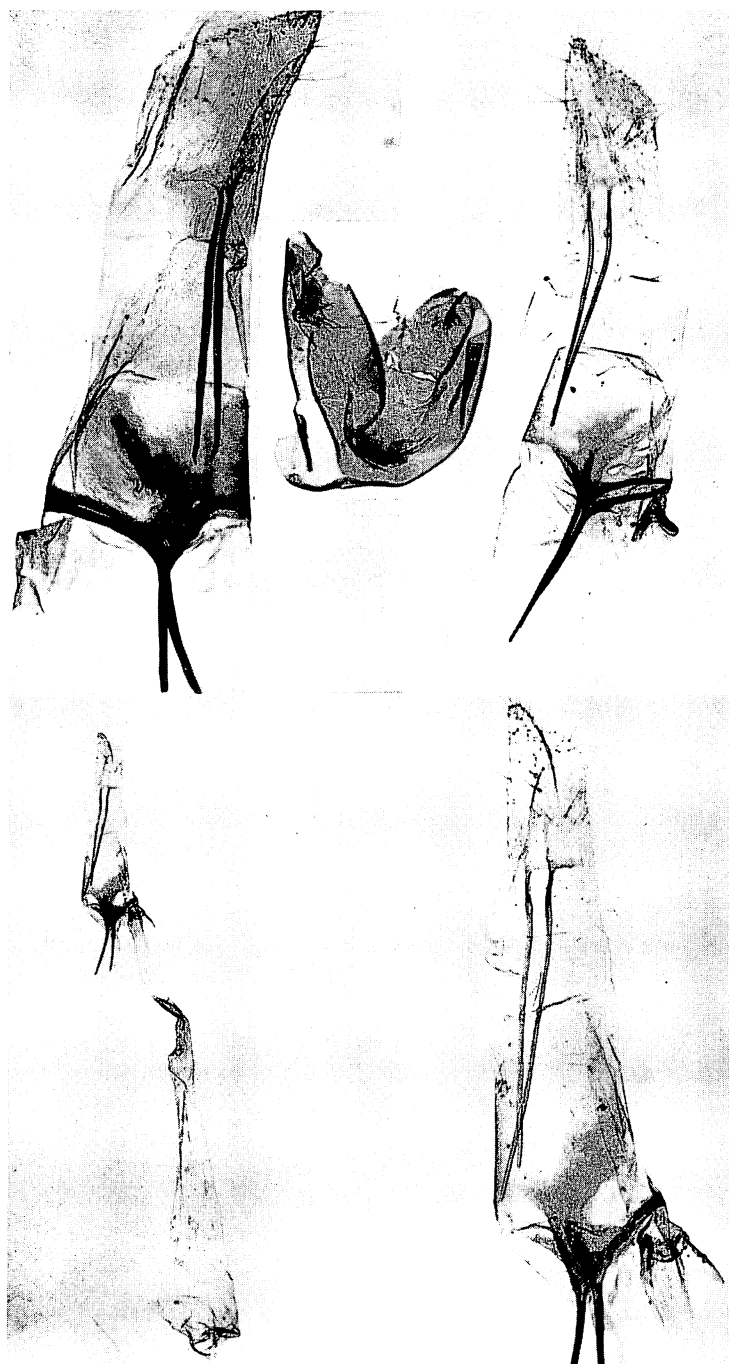


Figure 289—*Tamsica*. Above, left: Part of the female genitalia of *geralea* (Meyrick); Kauai; with a spermatophore inset. Right: Part of the female genitalia of *hyacinthina* (Meyrick); Kona. Below: Two figures of the female genitalia of *hydrophila* (Butler); northwest Koolau Mts., Oahu.

to find any described genus in which to place the Hawaiian species of this group, and a new genus has had to be erected for them.

There have been only six species described in this genus, but there is much confusion concerning them, and much work is needed to clarify the situation. The value of the slight differences found in the genitalia remains indecisive. We must check more reared and fresh material. The group appears to be a complex in the active process of speciation.

Larvae of some of the species have been found amongst grass roots.

"There are half-a-dozen endemic species of *Talis*, small obscure grass-moths, some of which exhibit a good deal of local variability in markings and colour. They are able to flourish in the driest localities near the coast, and also frequent open parts of the forest region in the high mountains. Most and probably all the species are under favourable circumstances very numerous in individuals. They are easily disturbed in the daytime and are attracted very readily to light at night." (Perkins, 1913:clvii.)

It is with the greatest of pleasure that I dedicate this genus to my friend W. H. T. Tams, officer formerly in charge of the Lepidoptera at the British Museum (retired since this text was written), who has for so many years given me so much assistance from his vast storehouse of knowledge of the Lepidoptera. Without his unstinted generosity and aid, the texts on the Lepidoptera for *Insects of Hawaii* could never have been developed in their present form.

PROVISIONAL KEY TO THE SPECIES OF TAMSICA

1. Palpi, measured from fore edge of eye to apex, not or hardly more than twice as long as an eye.....2
- Palpi, measured from fore edge of eye to apex, two and one-half to three times as long as an eye.....4
- 2(1). Fore wings with much white infusion, lines and spots usually rather bold; antemedial line well defined in unrubbed examples, white basad, dark distad; Oahu, Molokai, Lanai.....**floricolans** (Butler).
Fore wings not so, predominantly brownish and ochreous...3
- 3(2). Fore wings with lines moderately developed, with some dark costal markings; Oahu.....**hydrophila** (Butler).
Fore wings with lines obsolete and no dark costal markings; Oahu.....**oxyptera** (Meyrick).
- 4(1). Palpi extending beyond fore edge of eyes for a distance about equal to two and one-half times the length of an eye; fore wings with postmedial line well marked and usually with some distinct yellow marks or lines; Hawaii.....**hyacinthina** (Meyrick).
Palpi extending beyond fore edge of eye fully as far as three times the length of an eye; lines of fore wings obsolete, without yellow marks.....5
- 5(4). Kauai species.....**geralea** (Meyrick).
Oahu species.....**homodora** (Meyrick).

Meyrick (1899:198) gave a key to these six species, but I have found it to be in error and misleading. I found the "first line" to be identical on the holotypes of *floricolans* and *hydrophila*, which Meyrick separated widely by his first dichotomy. The "dark tornal spot in cilia" of *oxyptera* is obscure at best and may not be present.

***Tamsica floricolans* (Butler), new combination** (figs. 282, 284, 286). Type of *Tamsica*.

Gesneria floricolens Butler, 1883:180.

Hednota floricolans (Butler) Meyrick, 1888:242.

Talis floricolans (Butler) Meyrick, 1899:200, pl. 5, fig. 16; 1904:356.

Endemic. Oahu, Molokai, Lanai (type locality: "on the sandy sea-shore at Mauna Lea [Maunalei] flying over flowers").

Hostplant: Unknown. Dr. Swezey (*Proc. Hawaiian Ent. Soc.* 7 (3):484, 1931) misidentified this species as *Mestolobes minuscula* (Butler) when he reared it from a whitish larva found among the roots of sugarcane on Oahu. He reported that the caterpillar "spun a frail cocoon in the soil."

Further study is required to ascertain the true distribution of the species. Some series under this name in collections contain more than one species. The Lanai holotype is a male.

***Tamsica gerala* (Meyrick), new combination** (figs. 284, 289).

Talis gerala Meyrick, 1899:198, pl. 5, fig. 14.

Endemic. Kauai (type locality: Waimea Mountains, 4,000 feet).

Hostplant: Unknown.

The holotype male had no abdomen when I examined it at the British Museum.

***Tamsica homodora* (Meyrick), new combination** (figs. 284, 287).

Talis homodora Meyrick, 1899:199; 1904:356.

Endemic. Oahu (type locality: Waianae Mountains, 3,000 feet).

Hostplant: Unknown.

The holotype is a male.

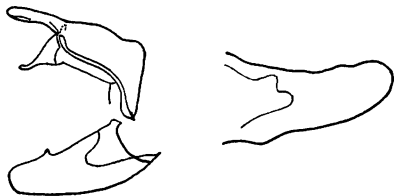


Figure 290—*Tamsica*. Left: A sketch of the male genitalia, lateral view, of the lectotype of *oxyptera* (Meyrick); Honolulu. Right: A right valve of the male genitalia of *geralea* (Meyrick); Kauai, 4,000 feet.

Tamsica hyacinthina (Meyrick), **new combination** (figs. 285, 288, 289).

Talis hyacinthina Meyrick, 1899:200, pl. 5, fig. 15.

Endemic. Oahu, Hawaii (type locality: Kona, 4,000 feet).

Hostplant: Unknown, but Dr. Swezey reared a moth from a pupa found among grass roots at Diamond Head in 1915.

Swezey (1926:75) reported this species from Nihoa, but I prefer not to accept the identification pending study of the Nihoa material.

The holotype is a male.

Tamsica hydrophila (Butler), **new combination** (figs. 285, 288, 289).

Scotomera hydrophila Butler, 1882:36.

Hednota hydrophila (Butler) Meyrick, 1888:242.

Talis hydrophila (Butler) Meyrick, 1899:199; 1904:356.

Endemic. Oahu (type locality: "Occurs near a stream about twenty miles from Honolulu.") (Blackburn, in Butler, 1882:37).

Hostplant: Unknown.

Tamsica oxyptera (Meyrick), **new combination** (fig. 290).

Hednota oxyptera Meyrick, 1888:243.

Talis oxyptera (Meyrick) Meyrick, 1899:199.

Endemic. Oahu (type locality: Honolulu).

Hostplant: Unknown.

Meyrick said that he "found it common in dry grassy places in August," but he had only one battered, moldy pair in his collection, and he had marked no type. I have designated his male specimen as lectotype.

Subfamily PHYCITINAE

Hulst, 1889, 1890. Ragonot, 1893. Heinrich, 1956.

This subfamily contains a number of species of economic importance; several of them are pests of stored foods. The taxonomy of the group is in chaos over most of the world; but since this manuscript was written (1956), Heinrich's large monograph of the American fauna has appeared, and his work has done much to elucidate the classification. The classic work on the subfamily is that by Ragonot (1893 and 1901), but extensive revision of that monograph is now required.

The frenulum of both males and females appears to be single in this subfamily; the ocelli and chaetosemae are present.

Six species (in four genera) are considered endemic. Of these, four are attached to Compositae and two feed on *Euphorbia*. Heinrich (1956) does not list *Euphorbia* as the host of any American phycitid.

KEY TO THE GENERA OF PHYCITINAE FOUND IN HAWAII

1. Fore wing with eleven veins 2
Fore wing with nine or ten veins 5
- 2(1). Fore wing with vein 4 arising from 5 at a distance from cell 3
Fore wing with veins 4 and 5 either separate or just joining at cell, but not fused for a distance beyond cell . . . 4
- 3(2). Hind wing with only three veins in the medio-cubital complex on posterior side of cell (veins 2, 3 and 4 + 5) **Cactoblastis**.
Hind wing with four veins in medio-cubital complex on posterior side of cell (veins 2, 3, 4 and 5) . . . **Ectomyelois**.
- 4(2). Hind wing with veins 4 and 5 free to base, vein 4 several times as long as breadth of cell **Cryptoblabe**s.
Hind wing with veins 4 and 5 fused for a considerable distance, vein 4 only about as long as breadth of cell **Genophantis**.
- 5(1). Fore wings with ten veins 6
Fore wings with nine veins 7
- 6(5). Hind wing with vein 4 plus 5 arising from cell **Homocosoma**.
Hind wing with vein 3 fused with 4 plus 5 for most of its length **Ephesiodes**.
- 7(5). Labial palpi curved upward in front of head 8
Labial palpi porrect 9
- 8(7). Hind wing with discocellular vein nearly straight, or only arcuate **Unadilla**.
Hind wing with discocellular vein strongly recurved 10
- 9(7). Hind wing with veins 3 and 4 arising from the same place **Plodia**.
Hind wing with veins 3 and 4 distinctly separate at origins **Rhynchephestia**.
- 10(8). Male with a strongly developed costal fold on fore wing (see figure 317 of *Ephesia cautella*); female with ovipositor short and broad, the posterior apophyses at most only a little longer than breadth of broadest part of ovipositor complex **Ephesia**.
Male fore wing without a costal fold; female with ovipositor very long and narrow, the posterior apophyses more than twice as long as greatest breadth of ovipositor complex **Anagasta**.

Genus **CACTOBLASTIS** Ragonot, 1901:15

For description and review of this genus of four or five species, see Heinrich (1939:354; 1956:245). Its species are natives of South America.

Cactoblastis cactorum (Berg) (figs. 291, 292, 293, 294). Type of *Cactoblastis*. *Zophodia Cactorum* Berg, 1885:276.

Cactoblastis cactorum (Berg) Ragonot, 1901:16. Heinrich, 1939:356, figs. 9–9c, 48–48a, 80, 98–98a, 99 (an excellent account); 1956:246, figs. 66, 535, 1024.

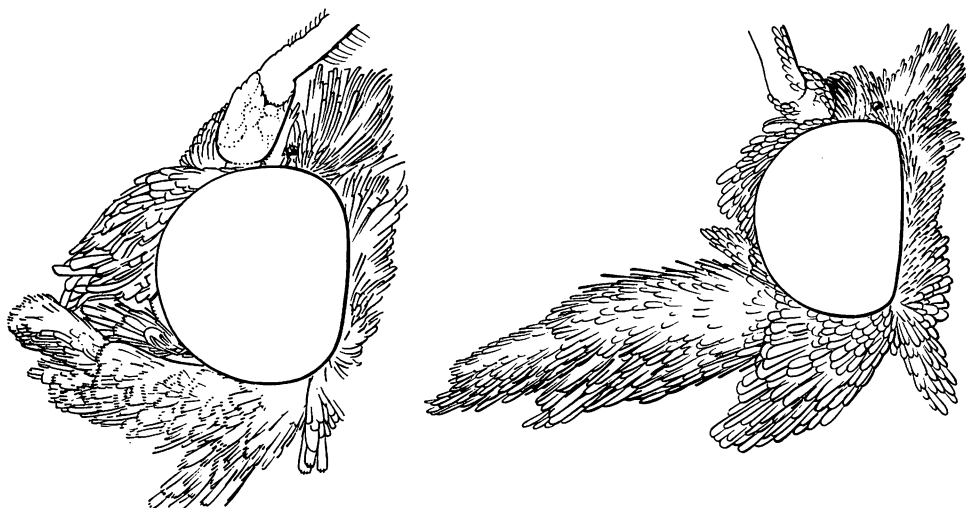


Figure 291—*Cactoblastis cactorum* (Berg). Heads of male (left) and female (right); note the sexual dimorphism.

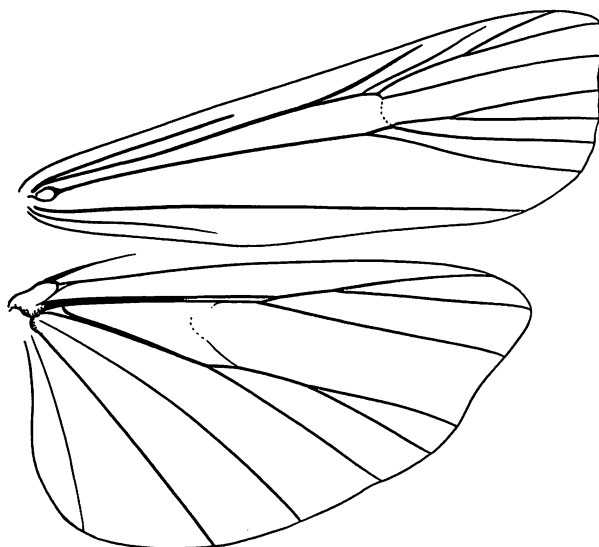


Figure 292—Wing venation of *Cactoblastis cactorum* (Berg).

Oahu, Molokai, Maui, Lanai, Hawaii.

Purposely introduced from Australia (where it had been introduced from America), and released near Kawaihae and Waimea, Island of Hawaii, in April and May, 1950, to control the *Opuntia* cactus pest. It is a native of Argentina and Uruguay, and possibly also Paraguay and southern Brazil.

Hostplant: *Opuntia*.

Parasite: *Trichogramma minutum* Riley, in the eggs; a fungus, either *Beauveria brassiana* or *globulifera*, attacks the larvae.

The eggs are laid in stick-like chains, often attached to cactus thorns. The brightly colored larvae, orange or red with large black spots, feed gregariously inside the *Opuntia* pads, which they hollow out to mere shells by their feeding. If an infested pad is viewed toward the light, the larval colony may be seen through the nearly paper-thin rind of the cactus.

Dodd, in his paper "The Control and Eradication of Prickly-pear in Australia" (1936:503), has given a summary of the outstanding success in the control of prickly-pear cactus in Australia, in which he played such an active and competent role. He says that "Approximately 25,000,000 acres of good grazing and agricultural land, previously a wilderness of dense prickly-pear, have been re-

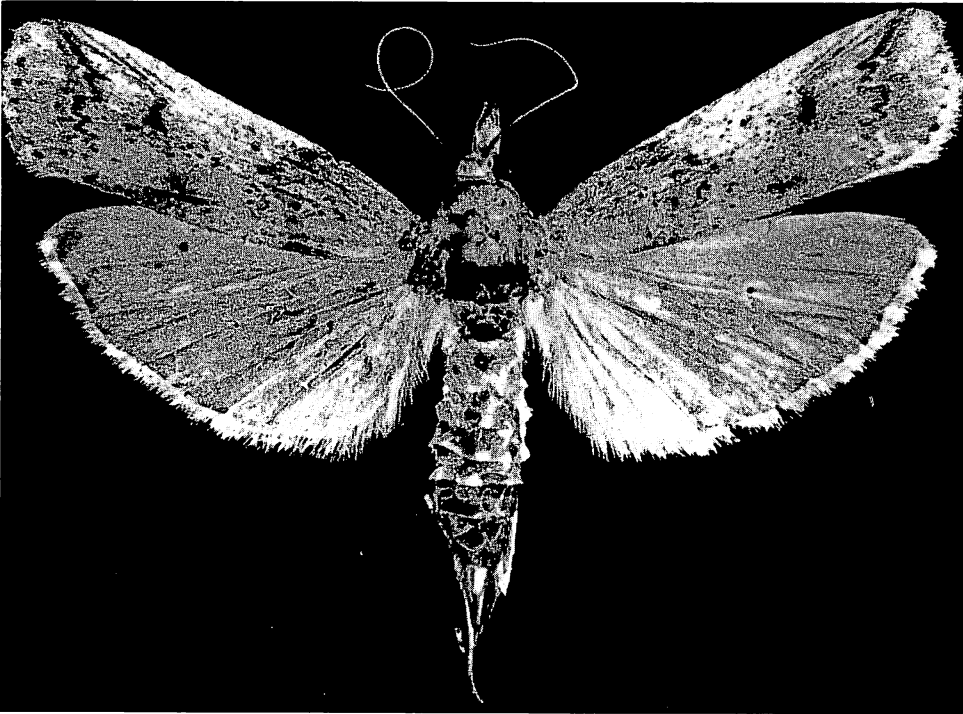


Figure 293—*Cactoblastis cactorum* (Berg), male, expanse 33 mm., reared from *Opuntia*, Nana-kuli, Oahu. (Courtesy J. W. Beardsley. Photo by J. T. Yamamoto.)

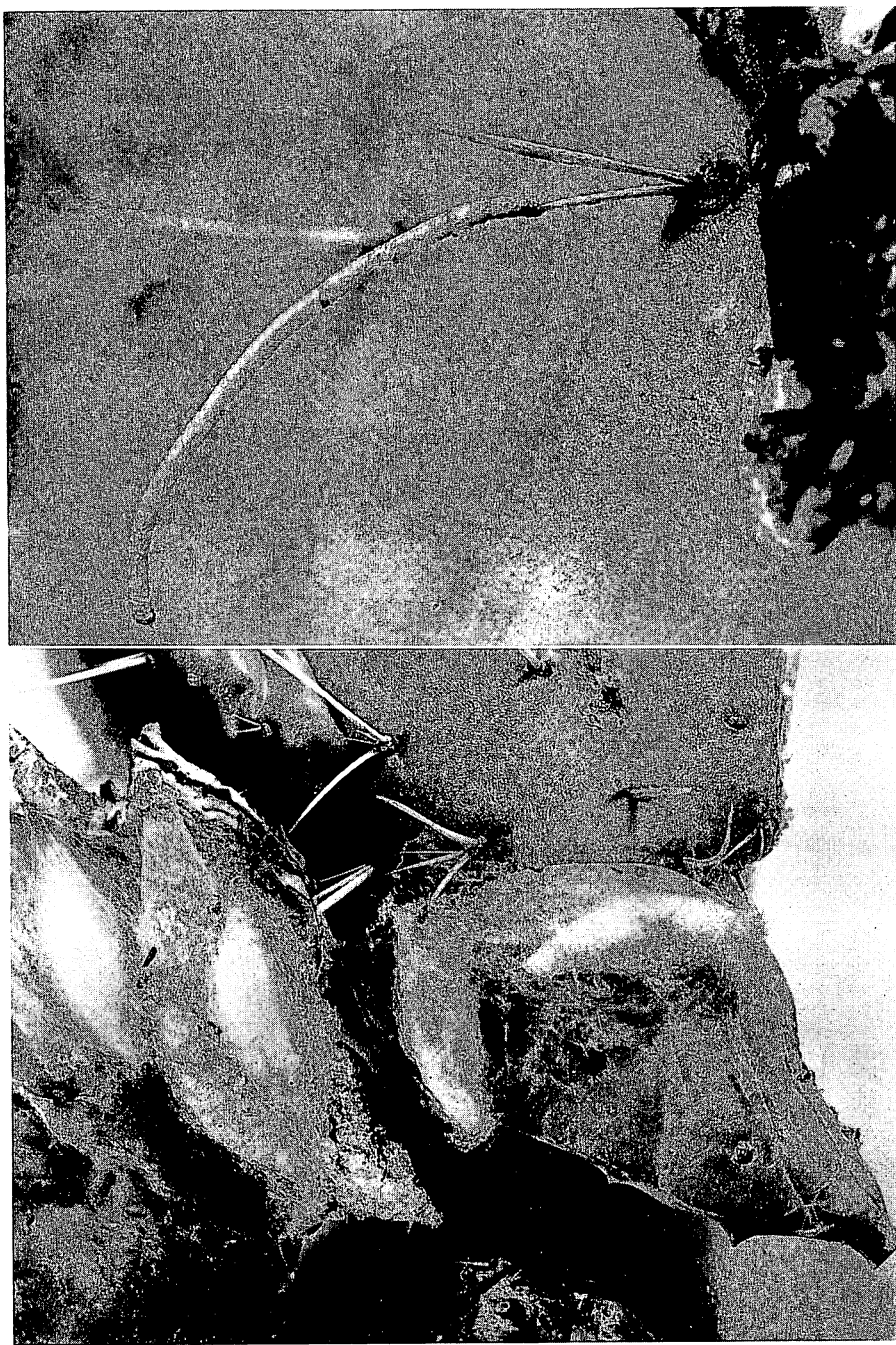


Figure 293-A—*Cactoblastis cactorum* (Berg). Above: an egg "stick" attached to an *Opuntia* spine. Below: a group of cocoons. (Courtesy J. W. Beardsley. Photos by J. T. Yamamoto.)

trieved to such an extent that they are rapidly being developed and brought into production . . ." since the introduction of this moth to Australia. In 1925, the increase in spread of the cactus was estimated at a million acres per year, and by that year about 60,000,000 acres had become infested with the cactus and rendered agriculturally worthless.

Dodd (1940:107-173) includes a colored plate of eggs, larvae, pupae and adult male and female, numerous illustrations of eggs, larvae and results of moth attack on cactus, and details of biology and parasites.

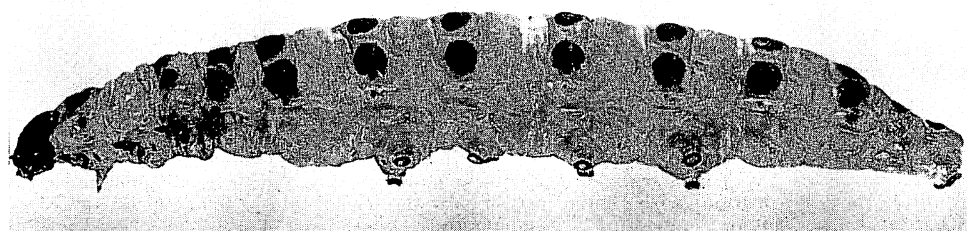


Figure 293-B—*Cactoblastis cactorum* (Berg). Above: a group of immature larvae on an *Opuntia* "pad." A mature larva below. (Courtesy F. A. Bianchi. Photos by J. T. Yamamoto.)

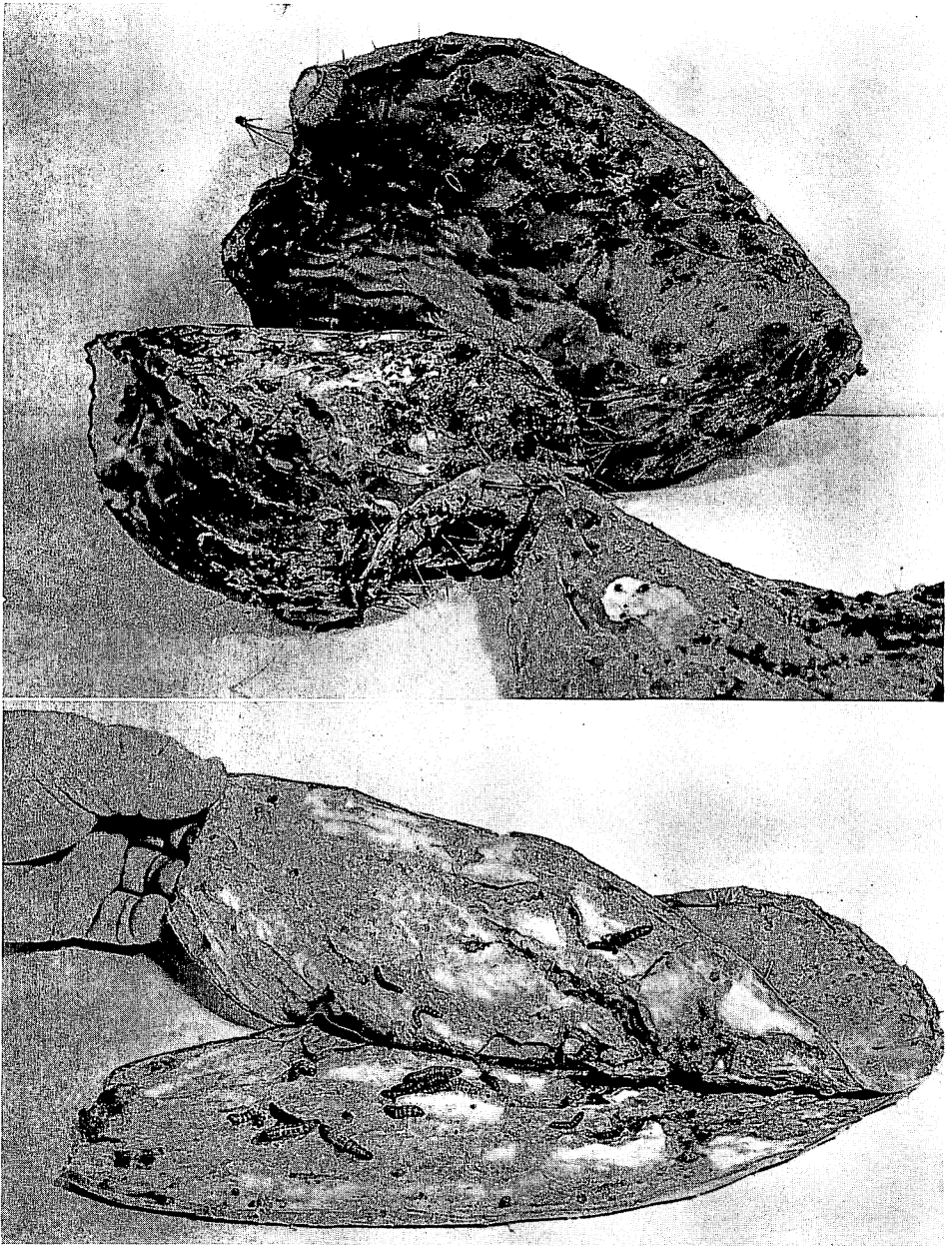


Figure 293-C—*Cactoblastis cactorum* (Berg). Above: heavily infested and damaged "pads" of *Opuntia* containing numerous larvae feeding internally. Below: an infested "pad" of *Opuntia* cut open to expose the larvae and to show the extensive damage caused by the feeding of the larvae. Compare these illustrations with that of the smooth surfaced, healthy "pad" in figure 293-B. (Courtesy F. A. Bianchi. Photos by J. T. Yamamoto.)

The plan to introduce insects for the control of the cactus in Hawaii was recommended long ago, but some of the ranchers and land owners objected because they considered that the cactus was of real forage value, and especially valuable in times of drought. It was not until about 1949 that permission was finally obtained for the introduction of cactus-eating insects in Hawaii. Following its importation, *Cactoblastis* became quickly established on the island of Hawaii, spread rapidly, and then made its way unaided to the other islands. It is a remarkable sight to see the results of the attacks of this moth on the massive and terrible growths of *Opuntia*.

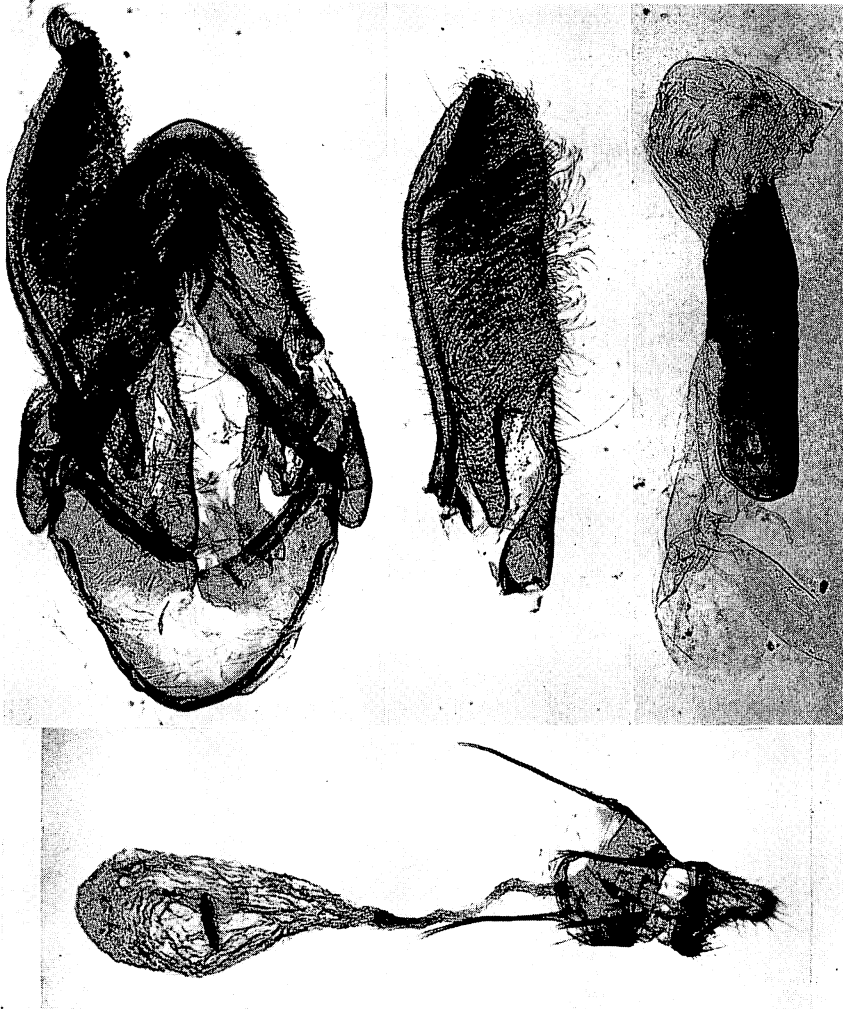


Figure 294—*Cactoblastis cactorum* (Berg). Above: Male genitalia, right valve separated, and aedeagus. Below: Female genitalia. Specimens from New South Wales, Australia.

Genus **ECTOMYELOIS** Heinrich, 1956:43**Ectomyelois ceratoniae** (Zeller) (figs. 295, 296, 297).

Myelois Ceratoniae Zeller, 1839:176.

Ectomyelois ceratoniae (Zeller) Heinrich, 1956:44, figs. 199, 678.

See Ragonot, 1893:57; Corbet and Tams, 1943:68, figs. 21, 68, 116, 153; and Heinrich, 1956:44, for synonymy.

Oahu.

Immigrant; nearly cosmopolitan. First recorded from Hawaii by Swezey in 1910, but known here before that date.

Hostplants: In seeds and pods of *Acacia farnesiana*, *Caesalpinia sappan*, *Cassia bicaupularis*, castor bean (*Ricinus*), *Ceratonia siliqua*, *Erythrina monosperma*, *Haematoxylon campechianum*, *Prosopis juliflora*, *Samanea saman*; also in prepared dried fruits and nuts.

Parasites: *Microbracon pambertoni* Bridwell, *Persierola emigrata* Rohwer.

Genus **CRYPTOBLABES** Zeller, 1848

Ragonot, 1893:12, redescription and key to species. Heinrich, 1956:10.

Cryptoblabes aliena Swezey (figs. 298, 299, 300).

Cryptoblabes aliena Swezey, 1909:24, pl. 4, figs. 4, 5, 6, 7.

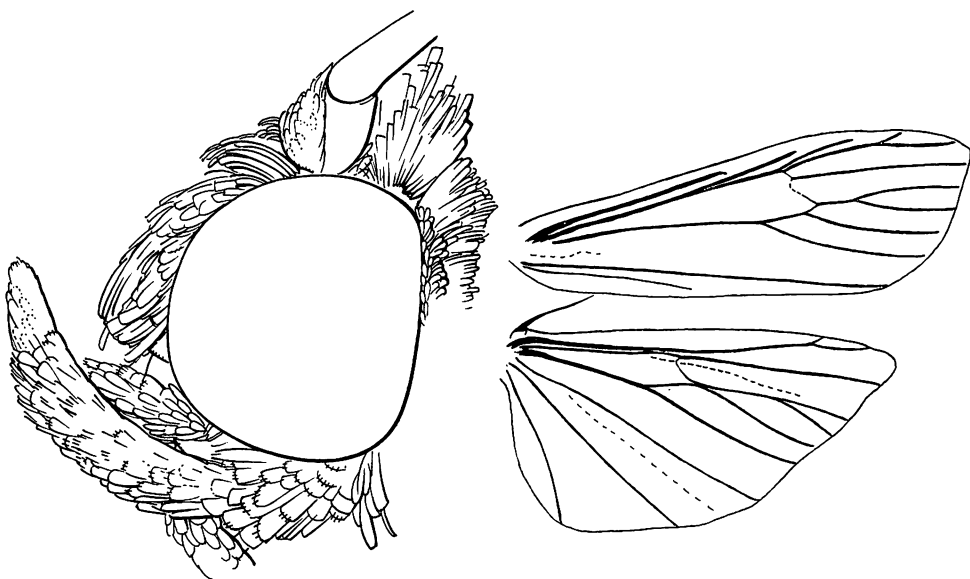


Figure 295—Head and wing venation of *Ectomyelois ceratoniae* (Zeller).

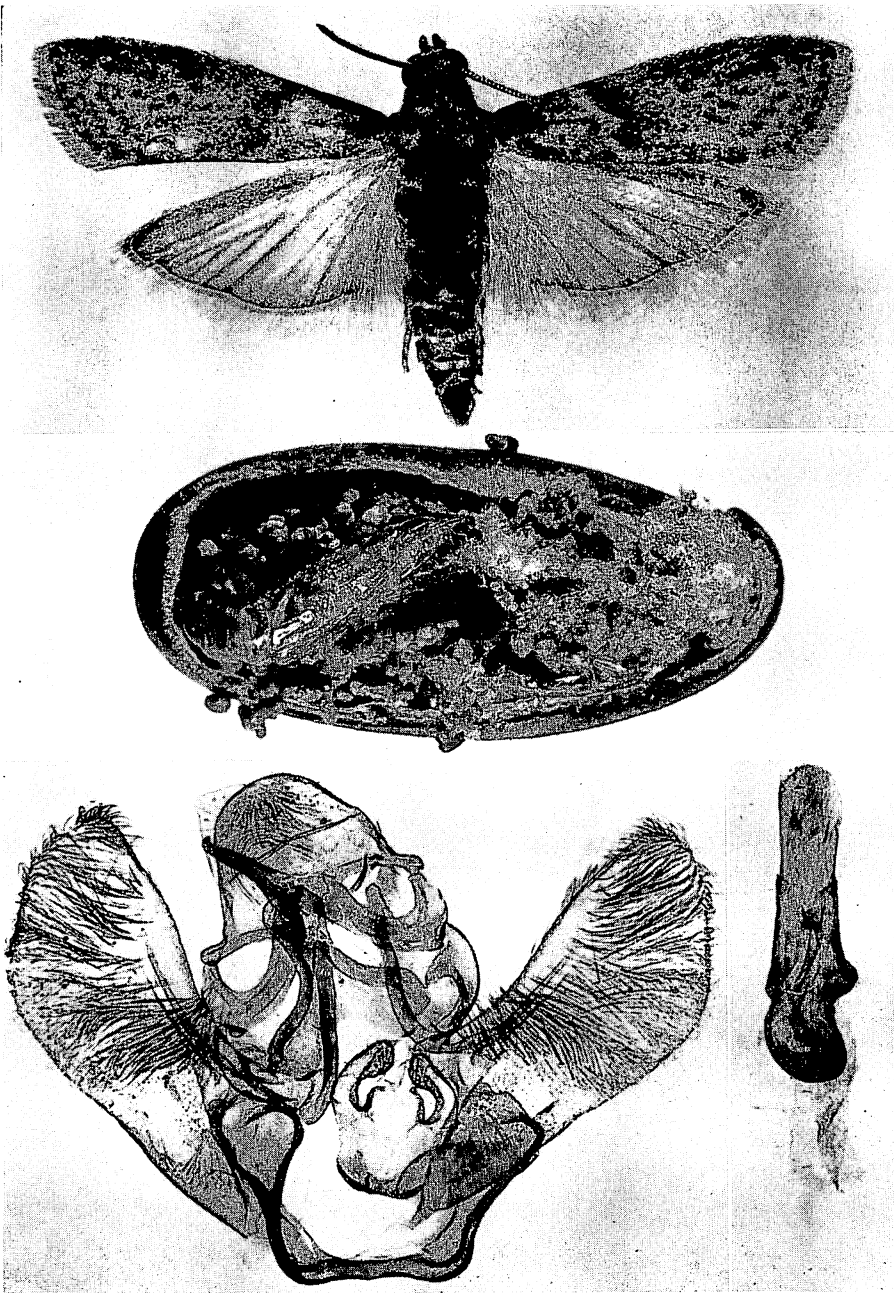


Figure 296—*Ectomyelois ceratoniae* (Zeller). Above: A specimen reared from wheat flour at Honolulu; length of right fore wing, 8 mm. Center: An *Erythrina* bean eaten by a larva, filled with frass and showing the cast skin of a pupa; length of bean, 19 mm. Below: Male genitalia (with aedeagus at right) of a European example from the Zeller collection.

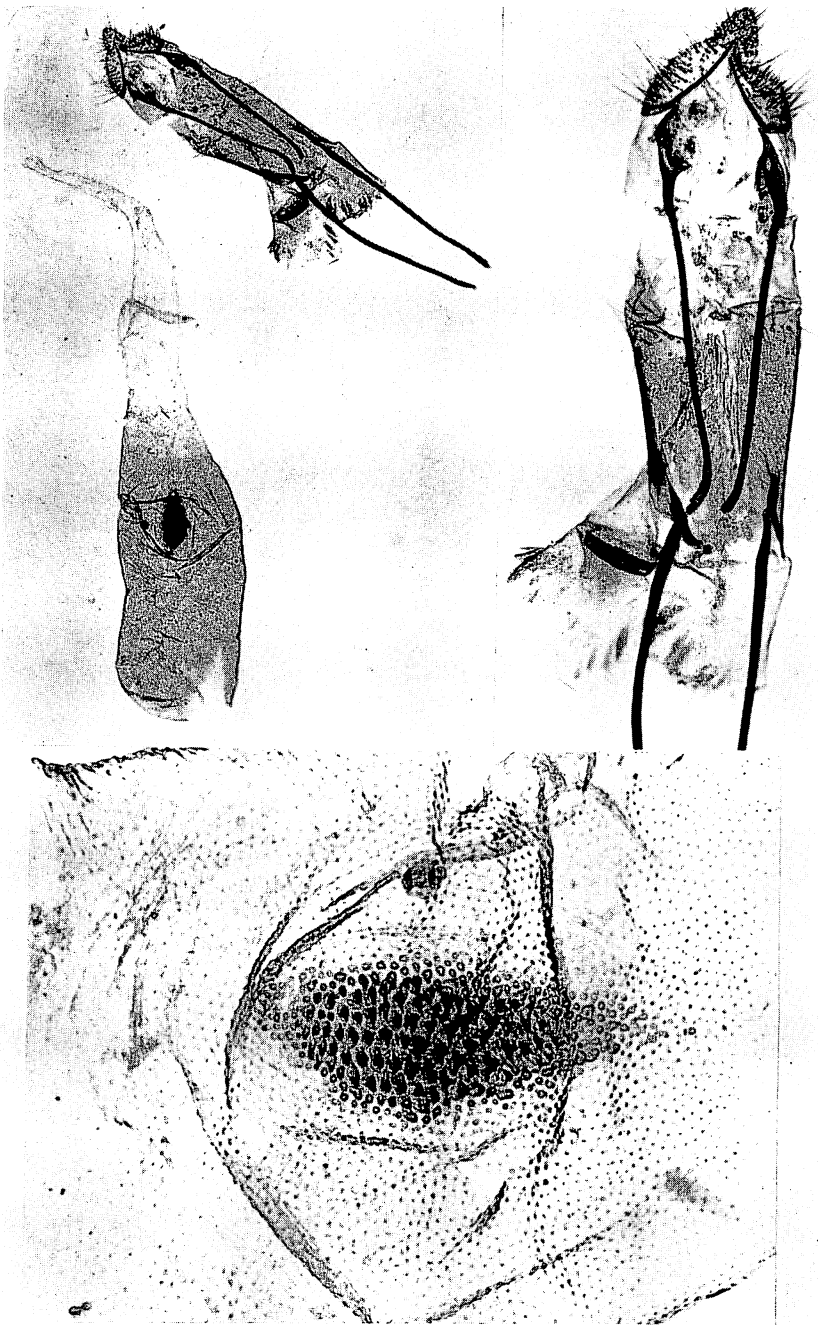


Figure 297—*Ectomyelois ceratoniae* (Zeller). Female genitalia.

Kauai, Oahu (type locality: Round Top, Honolulu), Hawaii.

Immigrant, but source not determined. First noticed in Hawaii by Swezey in 1905.

Hostplants: Beans, coffee, corn, cotton, *Cyanea procera*, *Ficus macrophylla*, *Lantana*, mango, mulberry, orange, *Osmanthus*, *Philodendron*, *Plectronia*, *Prosopis*, *Ricinus*, *Samanea saman* (monkey pod), *Schinus terebinthifolius* (Christmas berry), sorghum, sour sop, sugarcane.

Parasites: *Persierola emigrata* Rohwer, *Pimpla hawaiiensis* (Cameron).

This is a common moth whose caterpillars prefer to attack plants where there has been an infestation of aphids, scales or mealybugs. They are often numerous in flowers of *Prosopis* (algaroba), Christmas berry, mango, corn and other plants, in dried fruits of various plants, in vegetable debris caught on leaves of plants, and in similar situations. Some damage has been reported to coffee. The place of infestation may be webbed in an unsightly fashion by the caterpillars. Swezey (1954:171) calls it a "Scavenger moth."

A larva found by me in the blossom of *Cyanea procera* began to spin a cocoon on October 22, 1939, pupated on October 24, and the adult emerged on November 1.

Dr. Swezey (1909:24) published a good account of the moth, as follows:

The larvae of this Phycitid moth were first noticed in 1905; on sorghum, cotton and sugar cane. In each case, the plants were considerably attacked by Aphis. On sugar cane they often hide within a retreat made by the margin of the leaf being rolled down and fastened beneath with silk. Often several larvae may be in the same place. They eat off the substance of the leaf, leaving the opposite epidermis, which makes the leaf look dead on the margin. They often feed near the base of the leaf, adjacent to the sheath.

The larvae feed on leaves of sorghum in the same way. They also feed in the tops eating the flowers, bracts, and young seeds.

In 1906, larvae were found very abundantly feeding on sweet corn, which was badly attacked by corn-hoppers (*Peregrinus maidis*). They were beneath leaf-sheaths and husks, and in the ears eating the silks, young grains and even the bracts of chaff of the cob; they were also in the tassels. They spin slight silken tunnels where they feed.

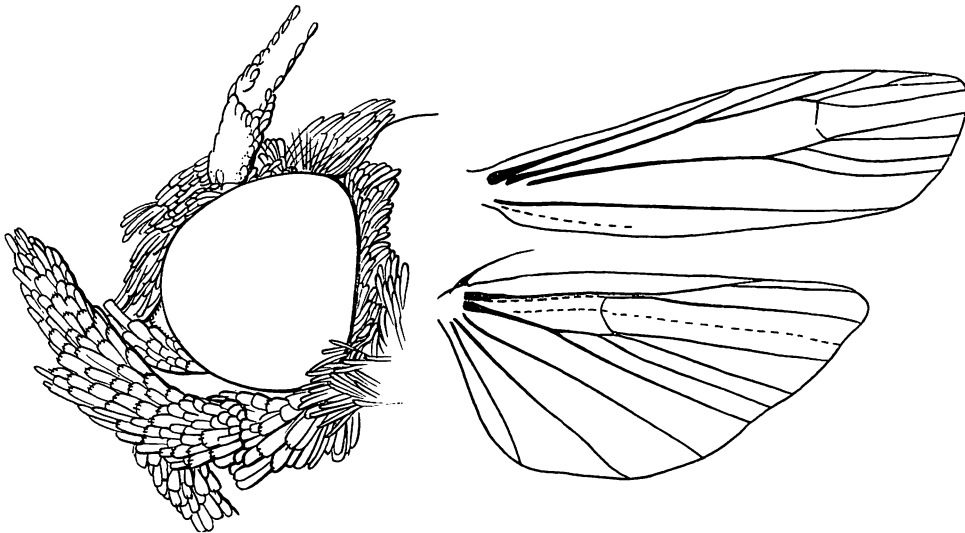


Figure 298—Head and wing venation of *Cryptoblabes aliena* Swezey.

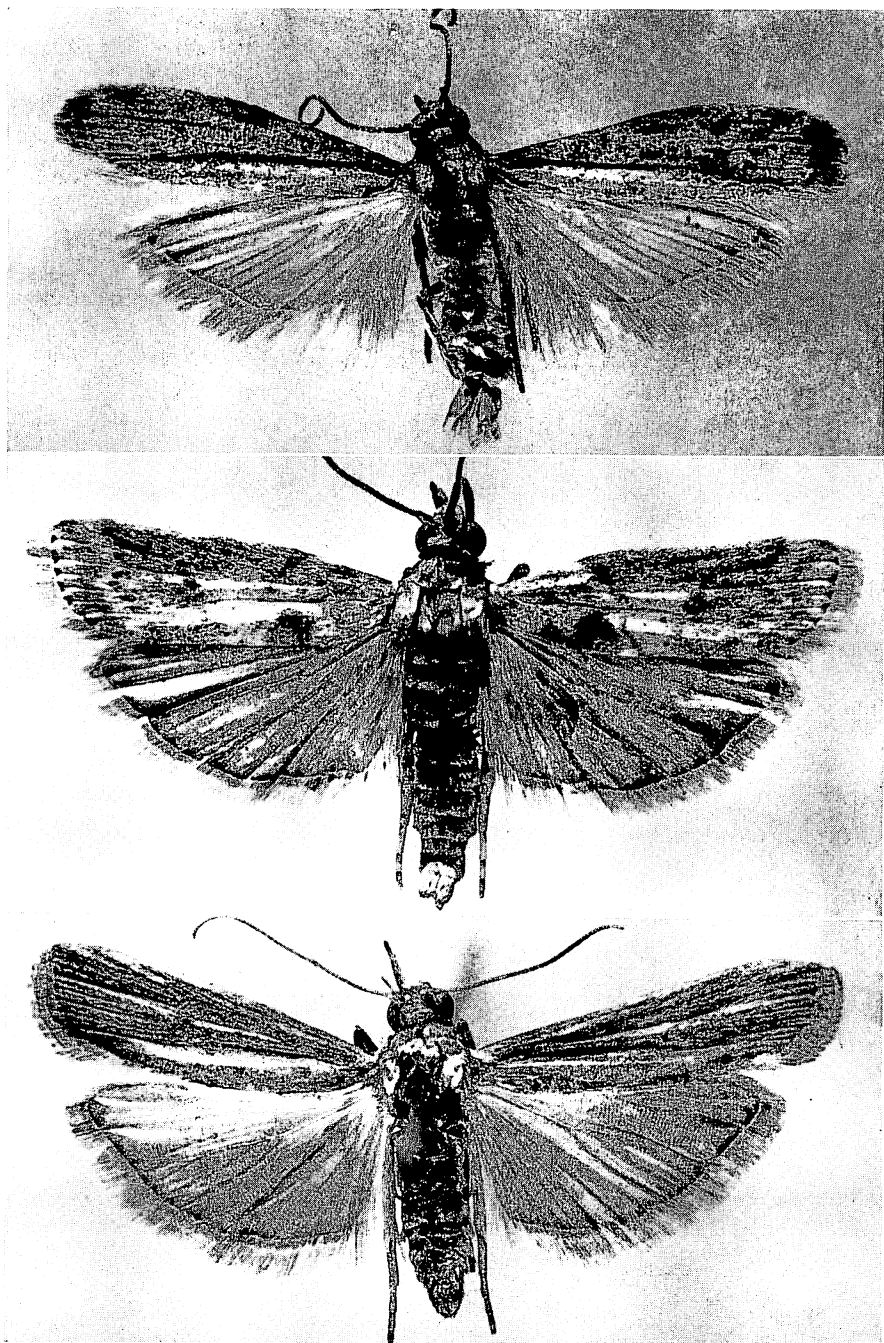


Figure 299—Above: *Cryptoblabes aliena* Swezey, type; Round Top, Honolulu; reared from *Lantana*; right fore wing, 5.5 mm. long. Center: *Genophantia iodora* Meyrick; Kaunuaohona, Oahu; right fore wing, 9 mm. long. Below: The type of *Genophantia leahi* Swezey; Diamond Head, Honolulu; right fore wing, 8 mm. long.

More recently, I have found the larvae quite abundant among the flower clusters of Algaroba, both fresh clusters, and the withered and dried up ones. I have also found them on orange, mulberry, and some other plants, feeding where there has been an infestation by Aphis or mealy bugs; and in the dried capsules of the castor oil plant.

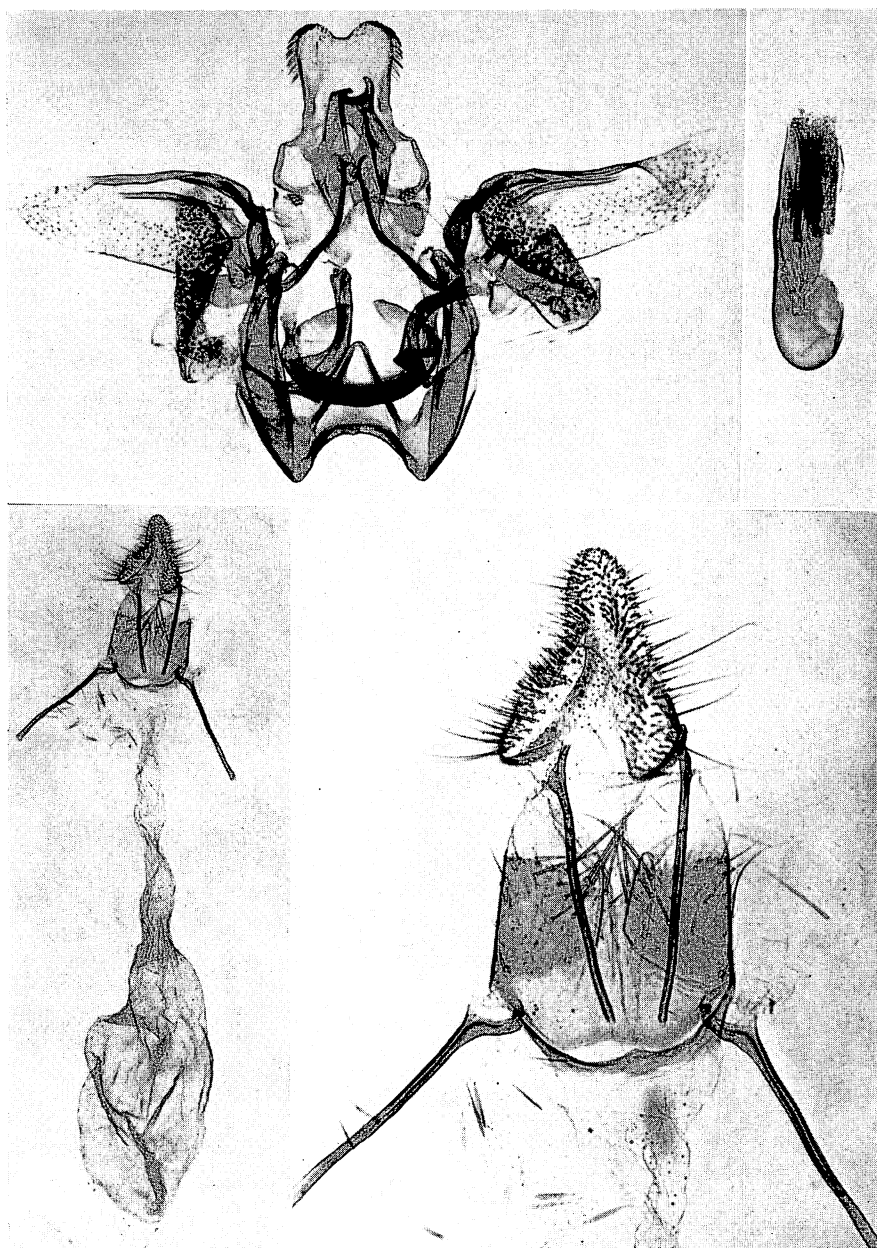


Figure 300—Male and female genitalia of *Cryptoblabes aliena* Swezey.

In May, 1908, I found them abundant on lantana where it was being killed by being attacked by *Orthezia*, the "Maui blight"; and in the same year found them on coffee trees amongst the berries, an occasional one being eaten by them. In all cases where these larvae occur along with Aphis, mealy bugs, etc., they do not feed on these latter insects themselves, although they may be attracted by the more or less sweetish excretions of these insects; they feed, however, largely on the tissues or else the dead or dying tissues.

It is thus seen that the larvae of this moth are quite general feeders. They are not to be considered very injurious, however; the other insects with which they are usually associated being far more injurious. They have not as yet become injurious to sugar cane; but are generally distributed, as I have occasionally observed the larvae in cane fields of various districts of the Islands.

Larva . . . is about 12 mm. long; nearly cylindrical, narrowing towards each end; olivaceous, yellowish, reddish, or fuscous, with several longitudinal darker stripes, brownish or fuscous; most conspicuous is a broad, somewhat double brownish or fuscous, stripe just above line of tubercles iii; head yellowish-brown to dark fuscous, eyes black; cervical shield concolorous, darker on anterior margin; tubercles small, concolorous or pale, with a black dot in center at base of hair; tubercle iii on segments three and twelve surrounded by a darker ring; tubercles i and ii in straight longitudinal line; iii just above spiracle, iv + v below spiracle and a little more anteriorly; hairs very pale brown; spiracles pale yellow. Larvae taken from sweet corn and algaroba blossoms were paler, usually yellowish or reddish; those from lantana, orange and other trees where *Orthezia*, Aphis, mealy bugs, etc., had been feeding, were mostly very dark fuscous, often almost black, and nearly uniformly colored.

Pupa . . . is 5-6 mm. long; bright light brown, paler below, greenish on wing- and leg-cases; punctured all over the back; fine hairs in two dorsal, two lateral, and two ventral rows; spiracles slightly raised; wing- and leg-cases extend to near apex of fourth abdominal segment; cremaster with two stout straight spines close together, touching, hooked at tip, firmly fastened into silk of cocoon, a few short hooked spines near their base. Formed in a slight cocoon amongst the web where the larva fed.

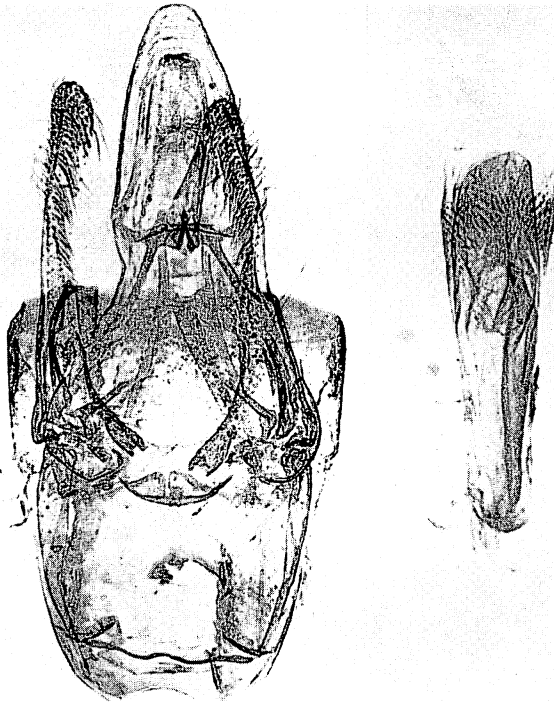


Figure 301—Male genitalia of *Genophantis iodora* Meyrick.

Genophantis iodora Meyrick (figs. 299, 301, 303). Type of *Genophantis*.

Genophantis iodora Meyrick, 1888:246; 1899:195, pl. 5, fig. 11. Swezey, 1954:81.

Endemic. Kauai, Oahu (type locality?), Molokai, Hawaii.

Hostplant: *Euphorbia celastroides*, *Euphorbia clusiaefolia*.

Parasites: *Horogenes blackburni* (Cameron), *Zaleptopygus flavo-orbitalis* (Cameron).

The caterpillars web together the leaves of the hostplant.

Meyrick described this species from one female, collected by Blackburn and without specific locality data. The type was not labeled by Meyrick, but I have done so.

This species is variable in color and pattern. It is more boldly marked than *leahi*. In some examples, the hind wing has a small cell formed by a crossvein between veins 3 and 5. Evidently vein 4 loops down to 3 from its fusion with 5. Most examples seen are considerably larger than those of *leahi*; some females reach 27 mm. in expanse, and most specimens exceed 22 mm. However, most examples of *leahi* are less than 20 mm. in expanse.

Genophantis leahi Swezey (figs. 299, 301, 319).

Genophantis leahi Swezey, 1910:103, pl. 3, fig. 1; 1954:81.

Endemic. Oahu (type locality: Diamond Head, Honolulu), Molokai, Maui, Hawaii.

Hostplants: *Euphorbia bifida*, *Euphorbia cordata*, *Euphorbia hirta*, *Euphorbia pilulifera*.

Parasites: *Chelonus blackburni* Cameron, *Horogenes blackburni* (Cameron), *Prisotomerus hawaiiensis* Perkins, *Zaleptopygus flavo-orbitalis* (Cameron).

The larvae hide in a web spun between adjacent leaves and along the stem. They eat one surface and mesophyll of the leaf, leaving the other epidermis; hence, their presence on the plant

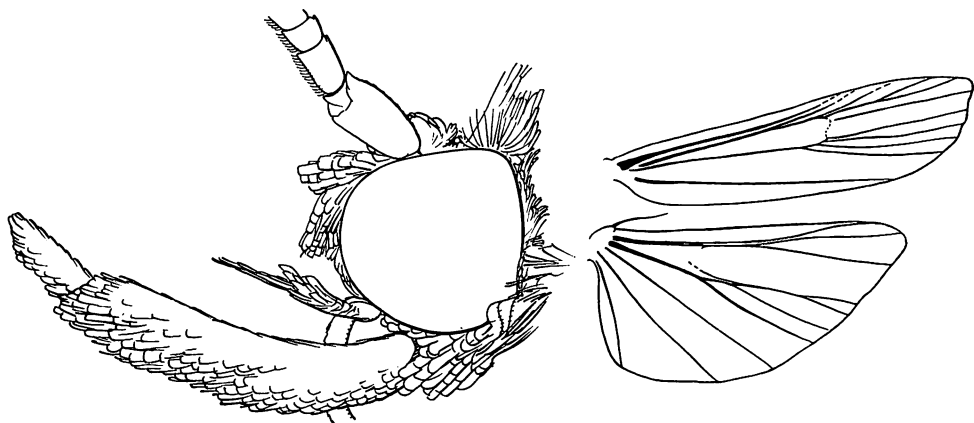


Figure 303—Head and wing venation of *Genophantis iodora* Meyrick.

is indicated by the webbed dead leaves. The pupa is formed in a slight cocoon amongst these or amongst leaves, etc., on the ground.

Full-grown larva—15 mm., light yellowish, with a wide blackish stripe on each side just above the line of spiracles, three narrower lines on dorsum between these two (these are lacking in younger stages); head with a black spot enclosing each eye cluster, a black spot in the upper outer part of each lobe, sometimes a small spot about middle of each lobe; cervical shield has two longitudinal black stripes wide apart, also a little blackened on lateral margins; tubercles minute; hairs pale; spiracles light brown; feet pale like the ventral side.

Pupa—8 mm., pale yellowish brown; wing-, leg- and antenna-cases extend to apex of 4th abdominal segment; abdomen terminates very bluntly, with two curved bristles near together at apex, two situated somewhat dorsally and a little farther apart and one at each extreme side directed laterally; two dorsal pits at base of segment 9. (Swezey, 1910:103-104.)

This is a smaller and paler species than *iodora*, and it lacks transverse markings on the fore wing.

Genus **HOMOEOSOMA** Curtis, 1835:190

Ragonot, 1901:227, redescription and key to species. Heinrich, 1956:219.

Although three species have been assigned to this genus in Hawaii, I leave only one species, *albosparsum* (Butler), here because it has ten fully developed veins in the fore wing, with veins 4 and 5 long and well developed from their common basal stalk.

Grensted (1952:141) says that *Homoeosoma* is neuter and cannot possibly be feminine, yet some authors treat it as feminine.

***Homoeosoma albosparsum* (Butler), new combination** (figs. 304, 307, 311).

Ephestia albosparsa Butler, 1881:333.

Homoeosoma amphibola Meyrick, 1899:197, pl. 5, fig. 12. Swezey, 1954:227.

New synonym.

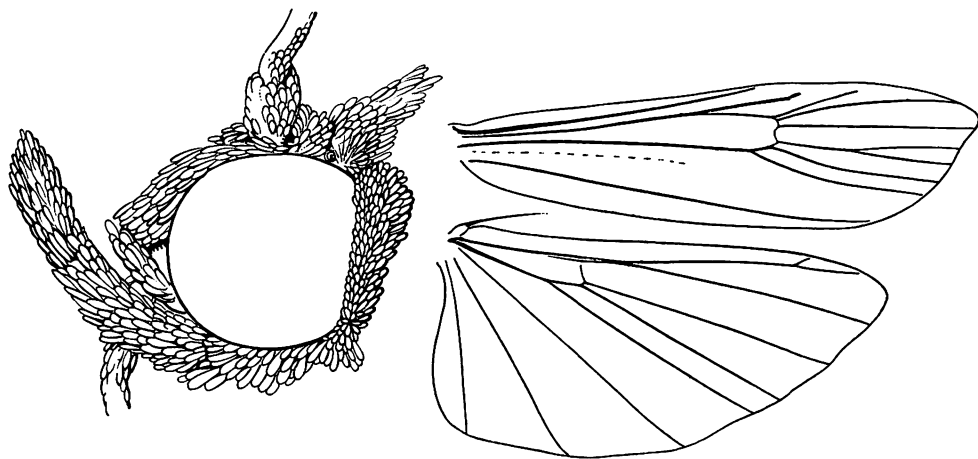


Figure 304—Head and wing venation of *Homoeosoma albosparsum* (Butler). The wing is from a specimen of the synonym *amphibola* Meyrick; it agrees vein for vein with the type of *Homoeosoma*.

Endemic. Kauai, Oahu, Maui, Hawaii (type locality: "Various localities on Hawaii" [does this mean on the island of Hawaii or Hawaiian Islands?]).

Hostplants: *Wilkesia gymnoxiphium*. Unless more than one species is involved, this moth must have other hostplants; *Wilkesia gymnoxiphium* is confined to Kauai, but the moth has been recorded from islands where that plant does not live.

Parasites: A species of *Sierola* (parasitism may be heavy); a fungus.

The caterpillars

feed on the flowers but do not injure the seeds. The larvae are so numerous that nearly every flower head is attacked. When there are no more flowers to feed on, the nearly grown larvae bore into the stem and feed on the pith, which occupies a considerable portion of the stem. The cocoons are formed within the hollowed-out stem. Some of the larvae shortly transform to pupae and then adult moths; but others remain as larvae for a long time within the cocoon and probably are able thus to carry over till the next blossoming season. None of the plants that have not reached the blossoming stage has been found attacked, nor has any other kind of plant been found attacked by this moth. (Swezey, 1932:199-200.)

Meyrick reduced the name of this species to a synonym of *humeralis*, but it is quite distinct. Meyrick's *amphibola*, however, is the same as this species and must be reduced to synonymy. Meyrick's holotype of *amphibola* is a female, not a male as he indicated; it was captured in the Waimea Mountains, 4,000 feet, Kauai. We have seen no males of this species.

Great confusion was caused me, because the mount of the male genitalia taken from a specimen of this species really was from an abdomen of *Rotruda mucidella* (Ragonot), which had been glued to the *Homoeosoma*! The wing venation agrees vein by vein with that of *sinuella* (Fabricius), the type of *Homoeosoma*. Veins 4 and 5 in the fore wings are conspicuously stalked.

The antemedial and postmedial bands in the fore wing are well developed and are nearly straight across the wing.

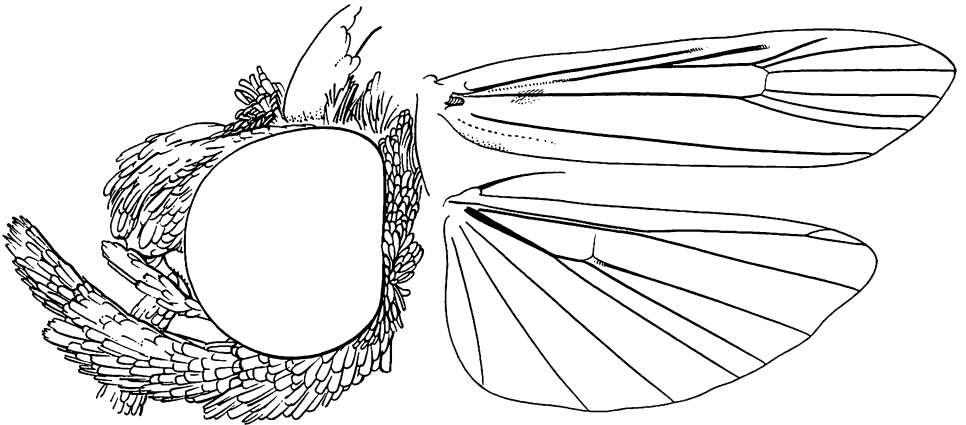


Figure 305—Head and wing venation of *Unadilla humeralis* (Butler).

Genus **UNADILLA** Hulst, 1899:197

Heinrich, 1956:227.

Type: *Unadilla nasutella* Hulst, 1899:197, from New Mexico.

Two endemic species are removed from *Homoeosoma* and placed in *Unadilla*, because veins 4 and 5 in the fore wings are fused or coincident; thus, normally, only nine veins are present in the fore wings. It appears, however, that the fusion of veins 4 and 5 in the fore wings may be subject to some variation. I have seen an example which outwardly was much like *humeralis*, but vein 5 was present as a short branch of 4 (but not well developed as in *Homoeosoma*).

Unadilla is an American Indian name; the name of a village in New York.

Although I have seen a rather large number of specimens of both *Unadilla* and *Homoeosoma*, I have seen only a few males.

KEY TO THE HAWAIIAN SPECIES OF *UNADILLA*

1. Antemedial transverse band on fore wing well developed, strongly oblique, its distal end meeting posterior margin of wing near middle of margin **bidensana** (Swezey).
2. Fore wing with antemedial and postmedial bands obsolete **humeralis** (Butler).

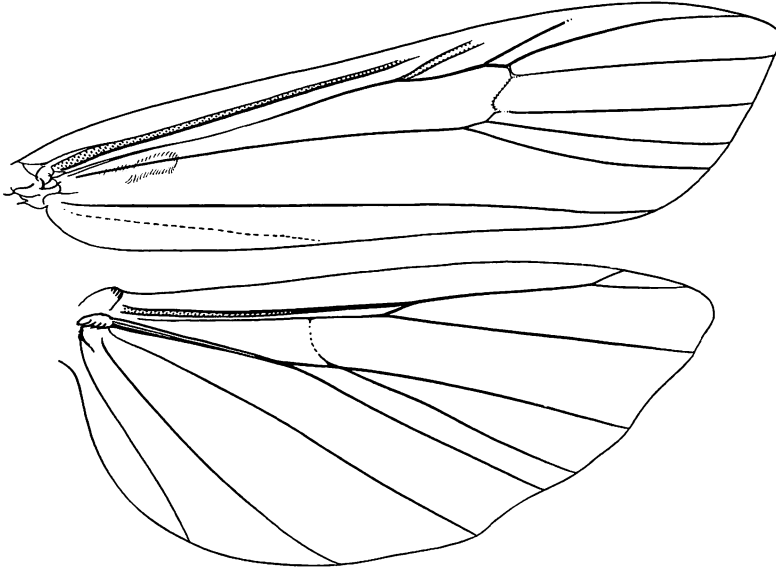


Figure 306—Wing venation of *Unadilla bidensana* (Swezey).

Unadilla bidensana (Swezey), **new combination** (figs. 306, 307, 310).

Homoeosoma bidensana Swezey, 1933:299.

Endemic. Kauai (type locality: Kumuwela, Kauai).

Hostplant: *Bidens cosmoides*.

Dr. Swezey reared four specimens from larvae found boring in the stems of the hostplant, and this is the only record we have of this interesting species. "The infested stems become swollen and gall-like; pupation takes place within this swelling." (Swezey, 1954:34.)

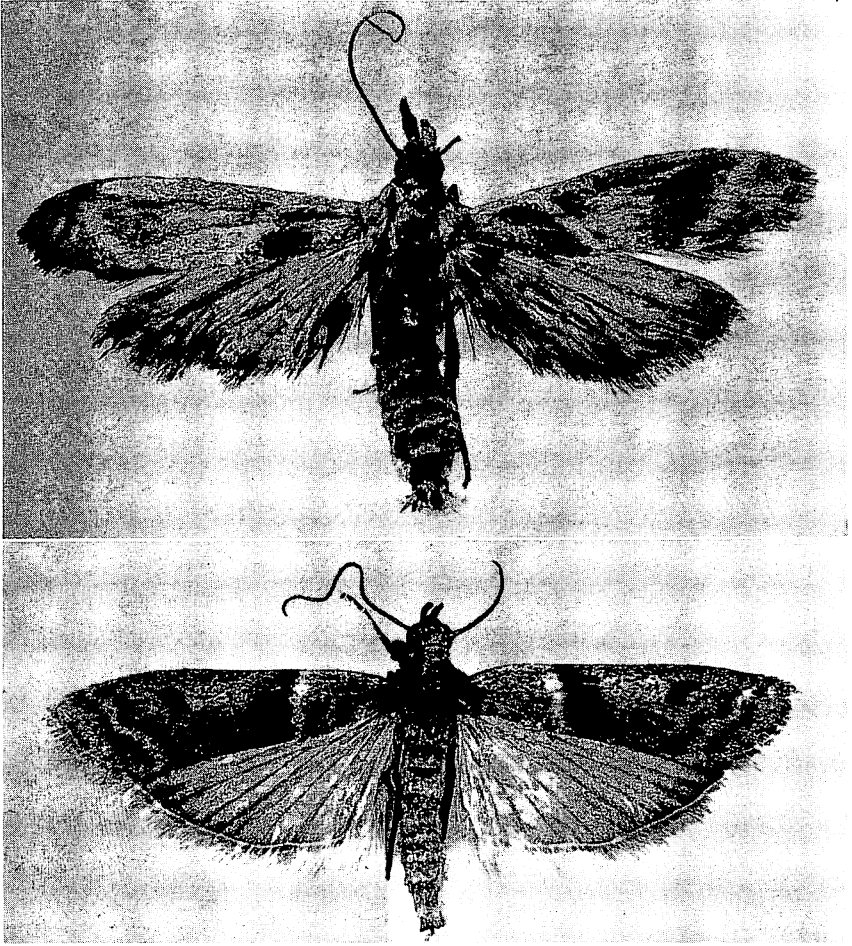


Figure 307—Above: A paratype of *Unadilla bidensana* (Swezey); Kumuwela, Kauai; right fore wing 11 mm. long (wings somewhat crumpled); reared from a larva found in the stem of *Bidens cosmoides*. Below: *Homoeosoma albosparsum* (Butler), from the female type of the synonym *Homoeosoma amphibola* Meyrick; Waimea Mts., Kauai, 4,000 feet; expanse, 21 mm. (this photograph is too dark, and the dark areas on the fore wings appear too dark here).

Unadilla humeralis (Butler), **new combination** (figs. 305, 308, 309, 311).

Ephestia humeralis Butler, 1881:332.

Homoeosoma humeralis (Butler) Meyrick, 1888:244; 1899:196.

Endemic? Kauai, Oahu (type locality ?), Molokai, Hawaii.

Hostplants: *Ageratum conyzoides*, *Bidens*, *Dahlia*, marigold.

Parasites: *Chalcis polynesialis* Cameron, *Microchelonus blackburni* (Cameron), *Horogenes blackburni* (Cameron).

The caterpillars feed in the flower heads of the hostplants and also bore in the stems.

This species is very distinct from *bidensana* or *Homoeosoma albosparsum*. The male genitalia are remarkably similar to those of *sinuella* (Fabricius), the type of *Homoeosoma*. These facts, together with the larval habit of attacking introduced plants, makes me question the endemism of the species.

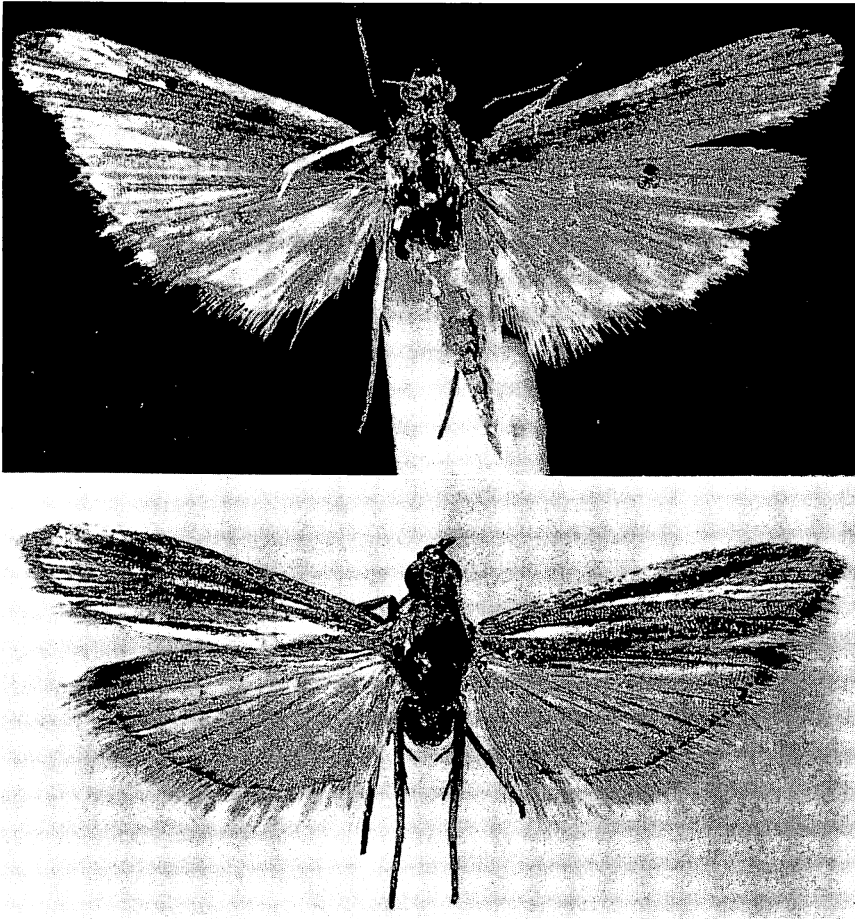


Figure 308—*Unadilla humeralis* (Butler). Above: The type; "Hawaiian Islands 81-7 114" (Blackburn); the black dots in the wings are pin holes. Below: An example in better condition; Leilehua, Oahu; right fore wing 7 mm. long.

Genus **RHYNCEPHESTIA** Hampson, 1930:51

This appears to be an endemic genus, but little more can be said about it at this time, although it may be allied to *Unadilla*; it contains only the following known species:

Rhynchephestia rhabdotis Hampson (figs. 312, 313, 314). Type of *Rhynchephestia*.

Rhynchephestia rhabdotis Hampson, 1930:52. Swezey, 1932:198, pl. 13, fig. 4; 1954:29, fig. 8.

Endemic. Maui (type locality: Haleakala crater).

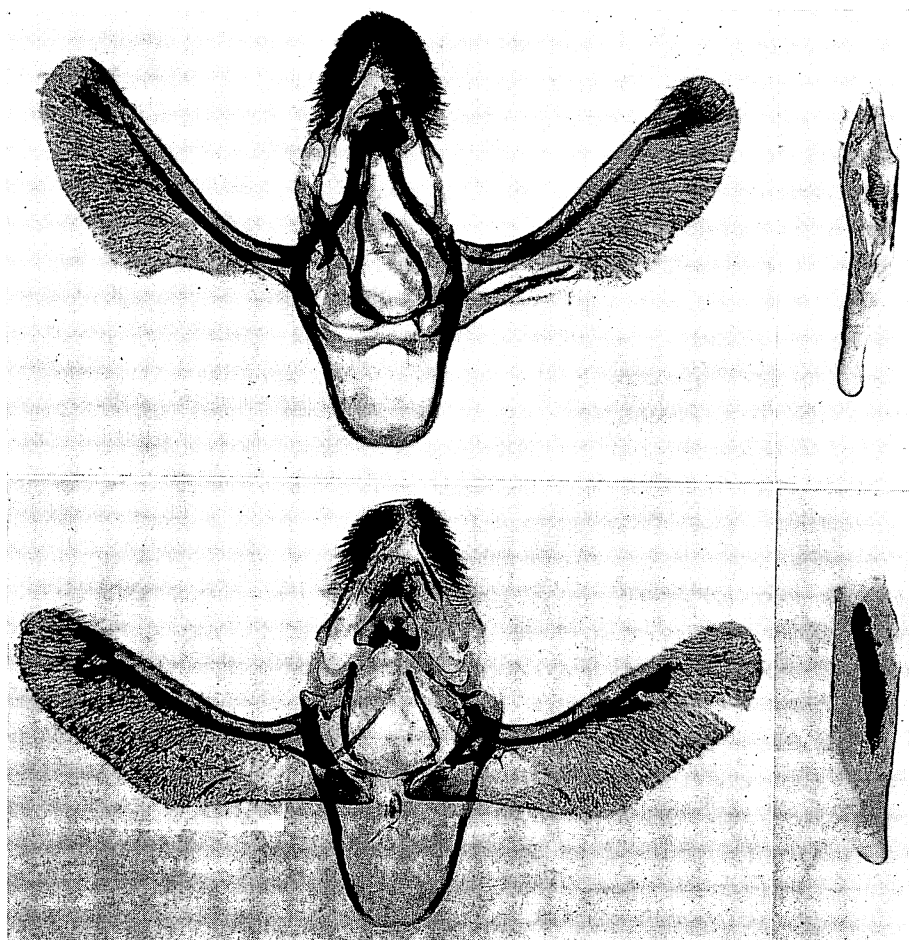


Figure 309—Above: Male genitalia of *Homoeosoma sinuella* (Fabricius), the type of *Homoeosoma* (not present in Hawaii, but given here for comparative purposes). Below: Male genitalia of *Unadilla humeralis* (Butler); Olaa, Hawaii.

Hostplant: *Argyroxiphium sandwicense macrocephalum* (silver sword).

The holotype in the British Museum bears the following label in Perkins' handwriting: "Phycitid n.sp. & gen.? bred from larvae in *Argyroxiphium*. Coll. by T. W. Terry. Bred by Koebele & myself in 1896 but the specimens were much spoiled."

"The larvae feed in the flower heads, destroying the seeds. In the seasons when there are no flowers they feed in the stem and among or at the bases of the leaves which are densely crowded together. The larvae are subject to a fungus which kills a large proportion of them. That is the main reason why so very few moths have been obtained from the larvae that have been brought down for rearing." (Swezey, 1932:198-199.) Perkins (1913:clvii), noted that the larvae were found

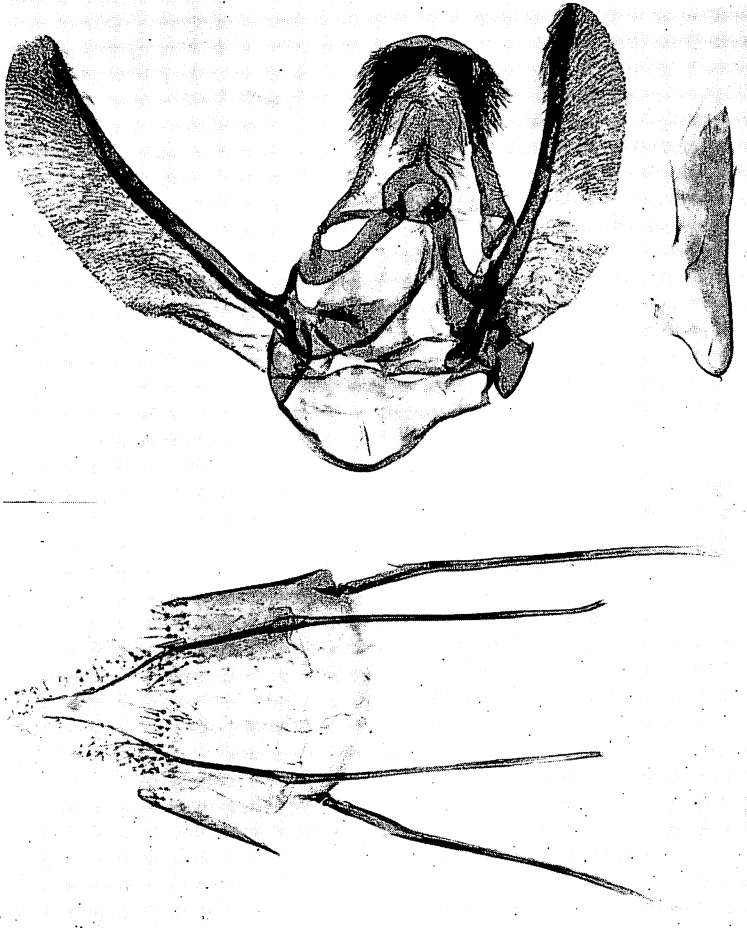


Figure 310—*Unadilla bidensana* (Swezey). Male and part of female genitalia (unfortunately mounted retracted and bursa not shown); Kauai.

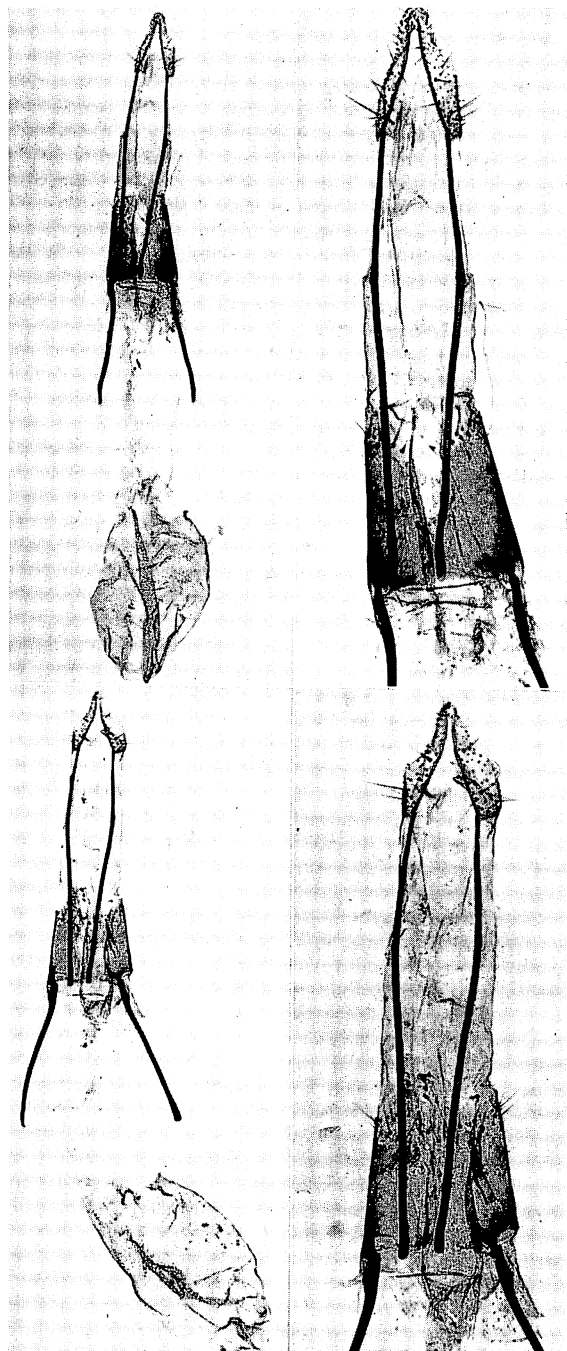


Figure 311—Above: Female genitalia of *Homoeosoma albosparsum* (Butler); from an example of *amphibola*, a synonym, identical with type. Below: Female genitalia supposedly of *Unadilla humeralis* (Butler), from Olaa, Hawaii; this requires further study, the genitalia appear to be the same as *albosparsum*.

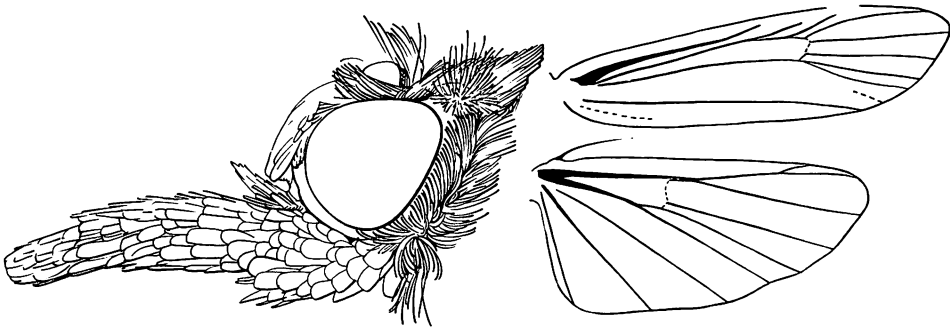


Figure 312—Head and wing venation of *Rhynchephestia rhabdotis* Hampson.

“excessively abundant in the flowering stem” of the hostplant, and that “Of many hundreds of caterpillars brought down from the crater to Honolulu in 1896 only one or two produced moths.”

The genitalia of this distinctive moth are closely similar to those of *Unadilla humeralis* (Butler).

Genus **EPHESTIODES** Ragonot, 1887:16

Ragonot, 1901:264, description and key to species. Heinrich, 1956:278.

The genus contains several North and South American species.

Ephestiodes gilvescentella Ragonot (figs. 315, 316). Type of *Ephestiodes*.

Ephestiodes gilvescentella Ragonot, 1887:16; 1901:264, pl. 34, fig. 5. Meyrick, 1899:196.

Oahu, Molokai.

Immigrant. A North American species introduced by commerce. First recorded in Hawaii by Meyrick in 1899 from specimens taken on Molokai by Perkins.

Hostplant: No information on the habits of the species is available.

I compared Molokai examples with a cotype in the British Museum and found them to agree.

Genus **EPHESTIA** Guenée, 1845

Ragonot, 1901:271, and Heinrich, 1956:301, redescription and key to species.

For synonymy, see Richards and Thomson, 1932:171.

Barrett, 1817. Corbet and Tams, 1943. Hinton, 1942.

This genus contains a number of species of moths which are of economic importance because they are pests of various stored food products such as cereals, dried fruits, nuts, cocoa, etc.

The reader is referred to the excellent account of the genus by Richards and Thomson (1932), where detailed information, keys, illustrations and an extensive bibliography may be consulted. For an illustrated account and key to the larvae of *cautella*, *elutella*, *Anagasta kühniella* and *Plodia interpunctella*, see Hinton (1942: 21); Richards and Thomson (1932) also give details of the immature stages. See Dickens (1936) for a report on the scent glands. Mosher (1916:72) noted that the pupae of *Ephesia* have the abdominal segments punctate and that the maxillae reach the apex of the wings, but that the pupae of *Plodia* have the abdominal segments smooth and the maxillae do not reach the wing apices. Since my manu-

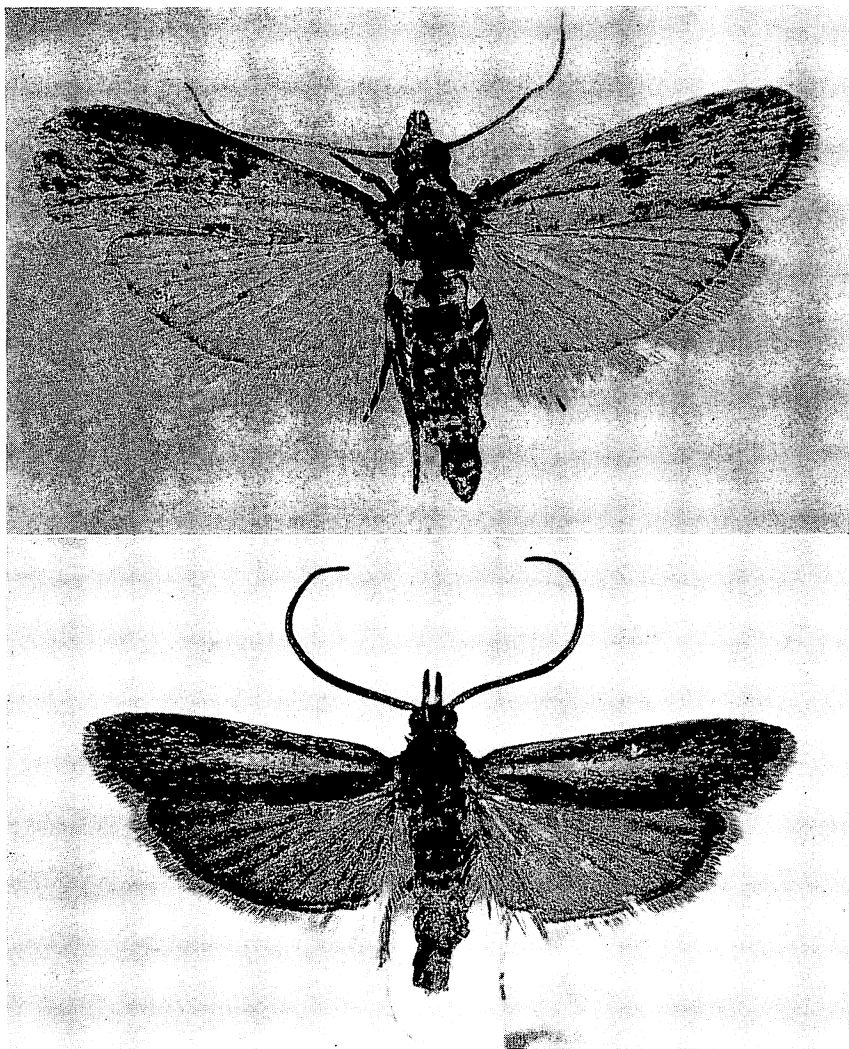


Figure 313—Above: *Plodia interpunctella* (Huebner); Honolulu; reared from walnut; right fore wing 8 mm. long. Below: The type of *Rhynchephestia rhabdotis* Hampson; Haleakala, Maui; reared from *Argyroxiphium*; expanse, 19 mm.

script for this section was completed, the Heinrich monograph of the American Phycitinae (1956) has appeared, and I have removed *kühniella* to *Anagasta*, to follow Heinrich.

The following key has been abstracted and altered from Corbet and Tams (1943:21).

KEY TO FOUR EPHESTIA-LIKE SPECIES WHICH MAY BE
FOUND IN HAWAII

1. Upper side of fore wing with the narrow, postdiscal band well defined and bordered on each side by a narrow, ferrugineous line, the dark bordering particularly strong near costa; with the dark, narrow, antemedial band slightly sinuate, slightly oblique (outwardly inclined toward posterior margin from costa), and the inner edge shaded with pale buff. Hind wing usually with veins 3 and 4 stalked. **elutella** (Huebner).
Upper side of fore wing with the postdiscal band rather obscure and not well defined. Hind wing with veins 3 and 4 not stalked. 2
- 2(1). Upper side of fore wing with the dark antemedial band straight, rather broad, prominent and continuous, and inwardly broadly bordered by pale scales.
. **cautella** (Walker).
Upper side of fore wing with the antemedial band not straight, but it is curved or angled. 3
- 3(2). Upper side of fore wing with the dark antemedial band irregular and comprising sagittate spots, and with the pale shading on inner edge of band almost obsolete; discoidals darkened; the postdiscal band obscure, sharply angled near costa, with inner edge dark-shaded. Upper side of hind wing pale greyish-white.
. **Anagasta kühniella** (Zeller).
Upper side of fore wing with the dark antemedial band sinuate, not irregular, and comprising a few dark, rounded spots, and with the inner edge pale-shaded; discoidals not darkened; the pale postdiscal band obscure, sinuate, with both inner and outer edges equally darkened. Upper side of hind wing greyish-white with a distinct yellowish tinge. **figulilella** Gregson.

Ephestia cautella (Walker) (figs. 317, 318, 323).

Pempelia cautella Walker, 1863:73.

Butler, 1877:50. Ragonot, 1901:292, pl. 34, fig. 23. Corbet and Tams, 1943:64, figs. 56, 62, 110, 147, synonymy.

The dried currant moth, almond moth, or fig moth.

Oahu, Laysan.

Immigrant; widespread by commerce. First recorded from Hawaii by Butler (1877:50).

Food: Cereals and cereal products, dried fruits, nuts, candies containing fruits or nuts, barley, corn, corn meal, etc.

Parasites: *Bracon hebetor* (Say), *Habrobracon juglandis* Ashmead, *Holepyris hawaiiensis* (Ashmead).

This species often builds up large populations in grain warehouses.

Most of the records attributed to *elutella* in Hawaiian literature prior to 1928 were incorrectly applied because of misidentification, and they really refer to this species.

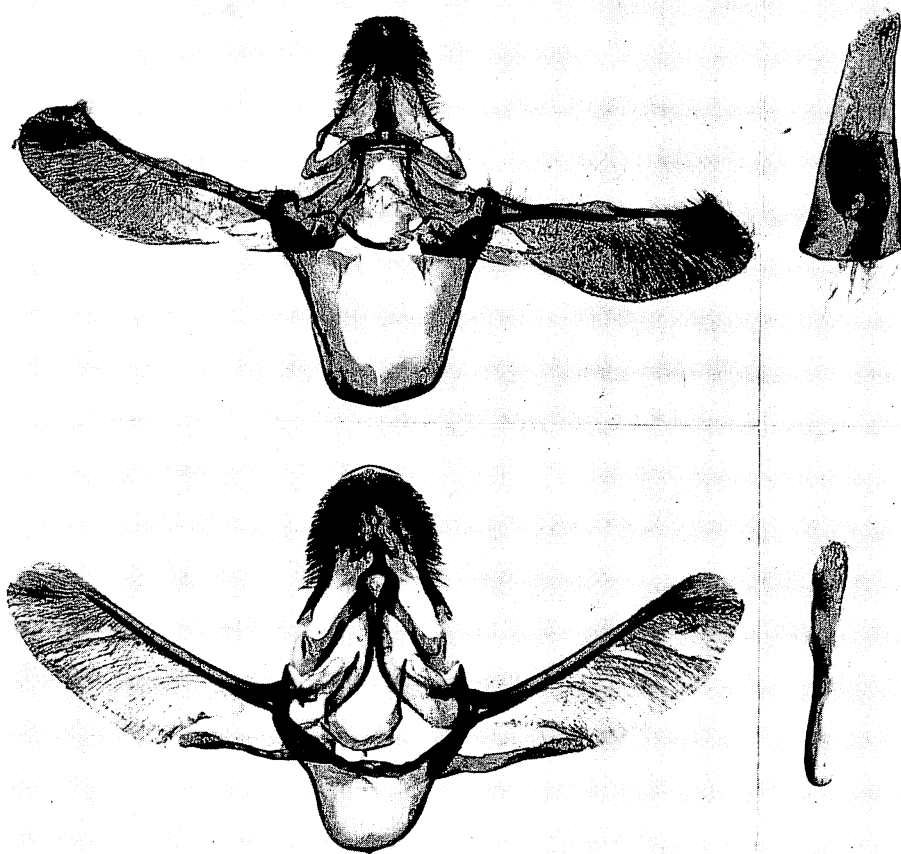


Figure 314—Above: Male genitalia of *Plodia interpunctella* (Huebner); Australia. Below: Male genitalia of *Rhynchephestia rhabdotis* Hampson; Maui.

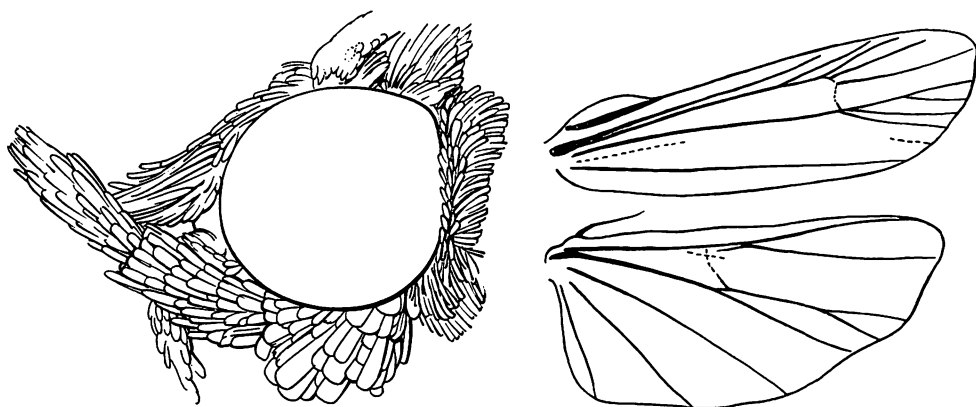


Figure 315—Head and wing venation of *Ephestiodes gilvescentella* Ragonot.

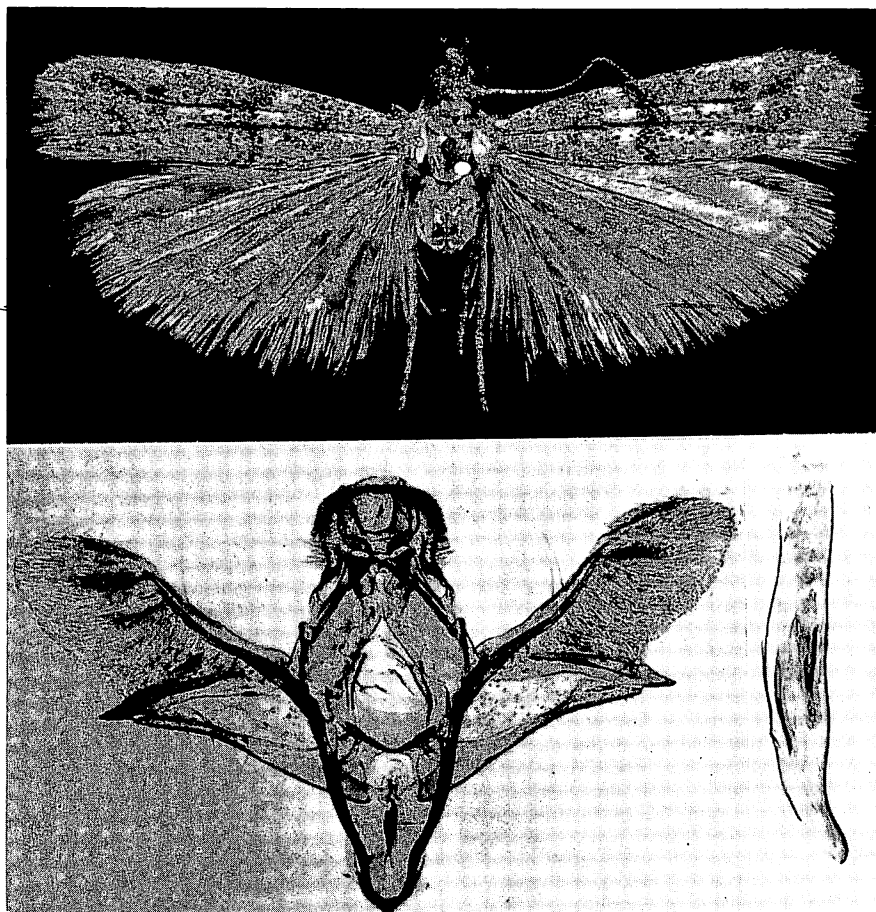


Figure 316—*Ephestiodes gilvescentella* Ragonot; Honolulu; right fore wing 5.5 mm. long. Male genitalia of a Molokai example.

Ephestia elutella* (Huebner) (figs. 317, 318, 320, 324, 325).Tinea elutella* Huebner, 1796, pl. 24, fig. 103.*Hyphantidium sericarium* Scott, 1859:207, pl. 61.

Meyrick, 1888:244; 1899:196. Ragonot, 1901:300. Bovington, 1933. Corbet and Tams, 1943:64, figs. 18, 55, 61, 109, 146, synonymy. Waloff and Richards, 1946.

The cacao or walnut moth.

Oahu?

Immigrant. Widespread by commerce. First recorded from Hawaii by Meyrick in 1888 from specimens collected by Blackburn. I am not certain that Meyrick's determination was correct, and it is not known if the species is really established in Hawaii.

For a detailed account of this species, with figures of egg, larva, pupa and adult and colored plate of adult, see Bovington (1933). For illustrations of larva, see Peterson (1948:208, figs. L49, J-M).

Ephestia figulilella* Gregson (figs. 318, 324, 326).Ephestia Figulilella* Gregson, 1871:385. Ragonot, 1901:282, pl. 34, fig. 14.*Ephestia desuetella* of Meyrick, 1888:244, not of Walker.*Ephestia ficulella* Barrett, 1875:271. Meyrick, 1899:196.

Corbet and Tams, 1943:68, figs. 59, 65, 113, 150, synonymy.

Immigrant; almost cosmopolitan; described from England.

This species was recorded from Hawaii by Meyrick in 1888 from specimens collected by Blackburn. I have no further records, and I am not sure that Meyrick's determination was correct. It is possible that this species may be found in imported foods such as dried fruit, but I have no evidence to indicate that it is established in Hawaii.

For extensive discussion, see Richards and Thomson (1932:194); for larva, see Peterson (1948:208, figs. L49, N-O).

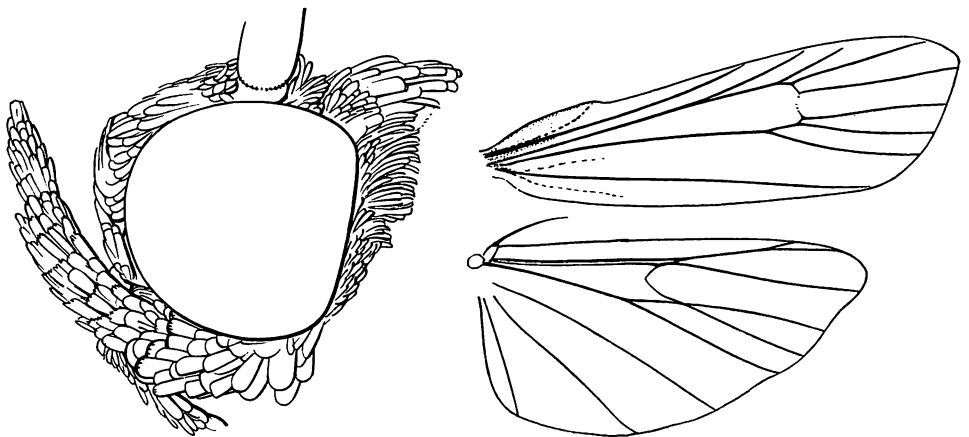


Figure 317—Head of *Ephestia cautella* (Walker) and wing venation of *Ephestia elutella* (Huebner).

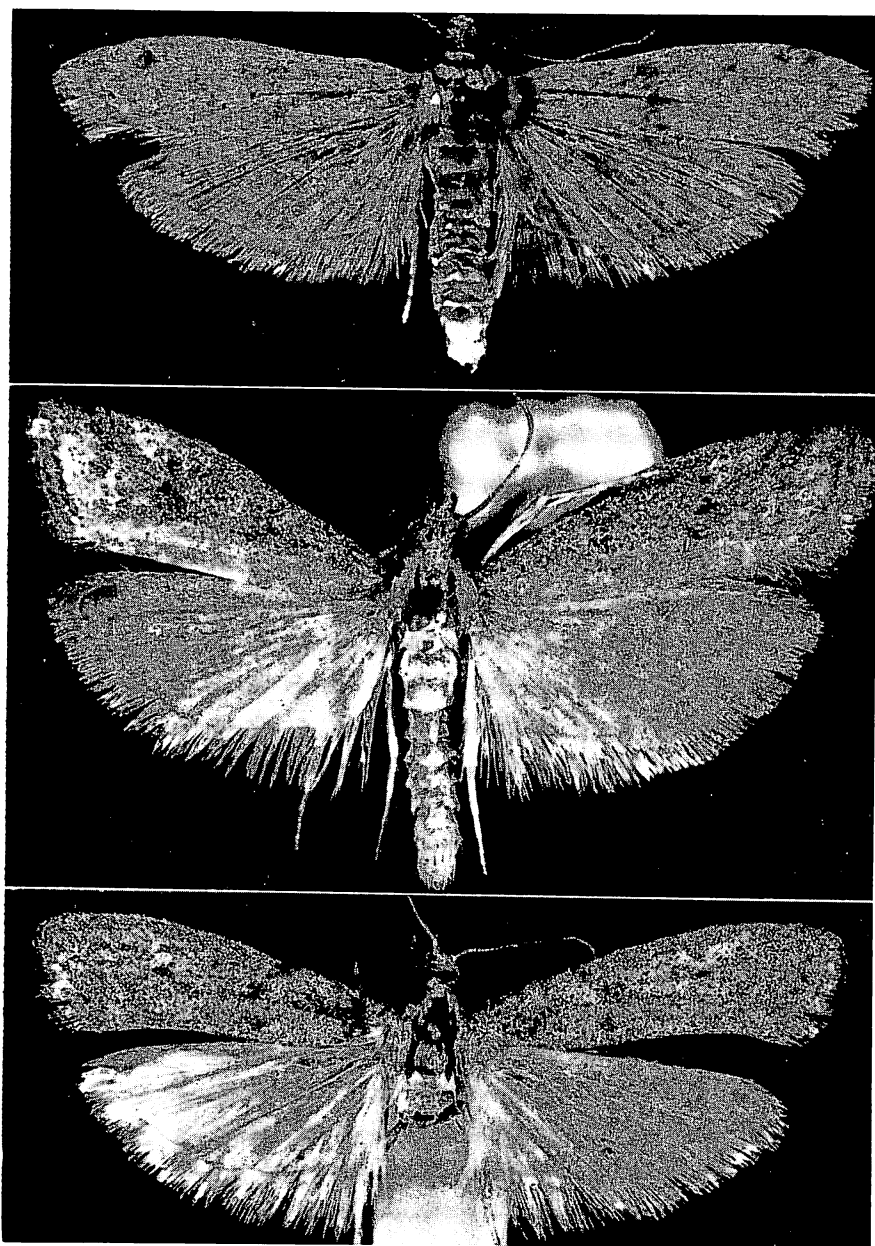


Figure 318—*Ephestia*. Above: *cautella* (Walker); reared from wheat flour; Honolulu; expanse, about 16 mm. Center: *elutella* (Huebner); a European example from the Zeller collection; expanse, 17 mm. Below: *figulilella* Gregson; Algeria; expanse, 16 mm.

Genus **ANAGASTA** Heinrich, 1953:299

Heinrich split this group away from *Ephestia* because of characters in the male and female genitalia and the fact that the fore wing in the male does not have a costal fold. See Heinrich for detailed discussion.

Anagasta kühniella (Zeller) (figs. 321, 327). Type of *Anagasta*.

Ephestia Kühniella Zeller, 1879:466. Ragonot, 1901:279.

Ephestia kuehniella, of authors. Johnson, 1896.

Ephestia sericarium, of authors, not of Scott. Corbet and Tams, 1943:68, figs. 58, 64, 112, 149, synonymy.

Anagasta kühniella (Zeller) Heinrich, 1956:300, figs. 626, 1124.

The Mediterranean flour moth.

This widespread pest evidently is not established in Hawaii, but it is occasionally

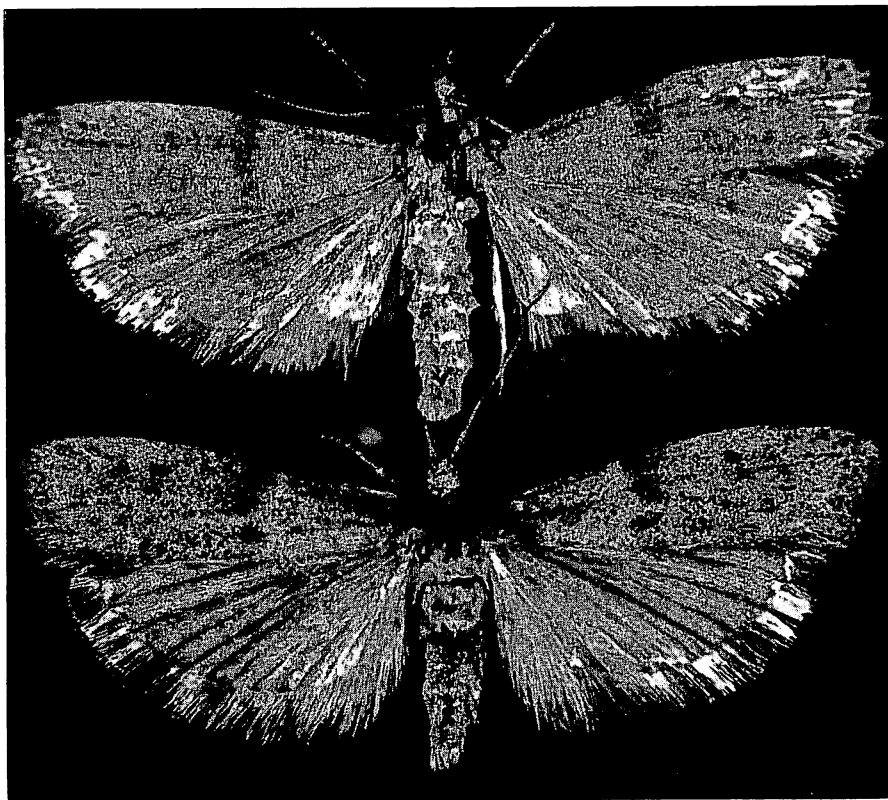


Figure 319—Male (above) and female *Ephestia cautella* (Walker); size range, 6.5–8.5 mm. (Tams photo; from Corbet and Tams, 1943.)

found in imported foodstuffs, particularly nuts, including walnuts and pecans. The first record of its capture in Hawaii is that by Swezey (*Proc. Hawaiian Ent. Soc.* 3(1):12, 1913), who collected a specimen in Kaimuki, Honolulu. He later reported that he had reared a specimen from a pupa "found in a tin of 'vacuum-packed' walnut halves from California" (*Proc. Hawaiian Ent. Soc.* 11(2):150, 1942). An early account of the species in the United States is that by Johnson (1896). For details of larva, see Peterson (1948:208, figs. L49 E-I).

There has been some confusion regarding the synonymy of this species, and in some of our literature the species is referred to as *sericaria* or *sericarium*, but that name is evidently a synonym of *Ephestia elutella*, which see.

Genus **PLODIA** Guenée, 1845

Ragonot, 1901:305. For synonymy, redescription and discussion, see Richards and Thomson, 1932:203. Heinrich, 1956:298.

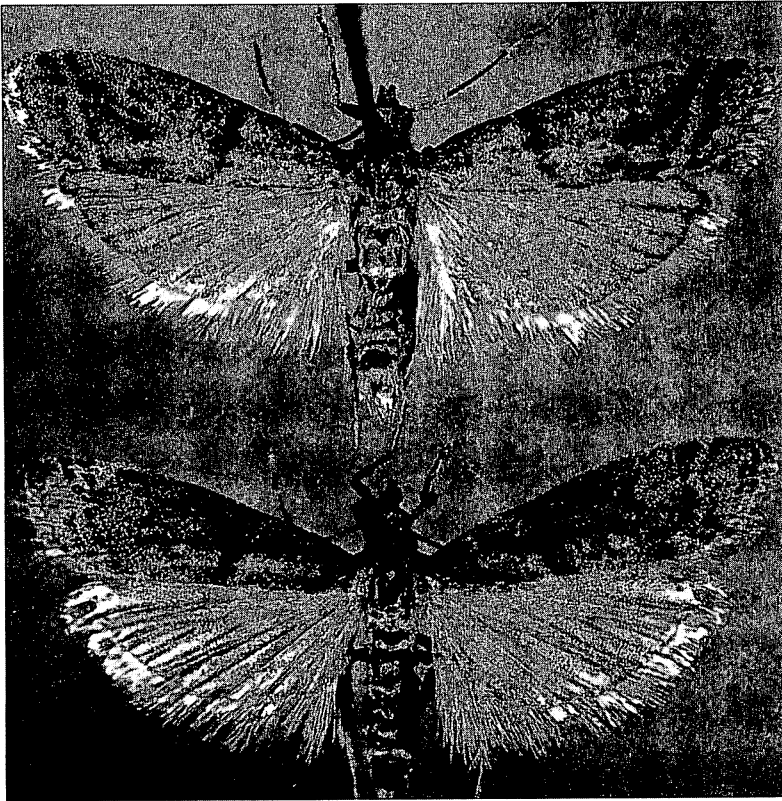


Figure 320—*Ephestia elutella* (Huebner). Male (above) and female; size range, 7–9 mm. (Tams photo; from Corbet and Tams, 1943.)

Plodia interpunctella (Huebner) (figs. 313, 314, 329, 330).

Tinea interpunctella Huebner, 1827, fig. 310.

Ephestia interpunctella (Huebner) Meyrick, 1888:244.

Plodia interpunctalis (misspelling), Butler, 1879:273.

Ragonot, 1901:305. Corbet and Tams, 1943:64, figs. 17, 54, 60, 108, 145, synonymy. Heinrich, 1956:298.

The Indian meal-moth.

Oahu.

Immigrant; nearly cosmopolitan. First found in Hawaii by Blackburn (Butler, 1879:273).

Food: Found in many kinds of stored food products, such as grains, dried fruits, nuts and cereals; also in candies, chocolate and certain dry, prepared foods.

Parasite: *Habrobracon juglandis* Ashmead.

The caterpillars do considerable damage to stored foods. The female moth may lay three to four hundred eggs. The larvae spin extensive silken webbing in and over the food attacked.



Figure 321—*Anagasta kuhniella* (Zeller). Male (above) and female; size range, 9–11 mm. (Tams photo; from Corbet and Tams, 1943.)

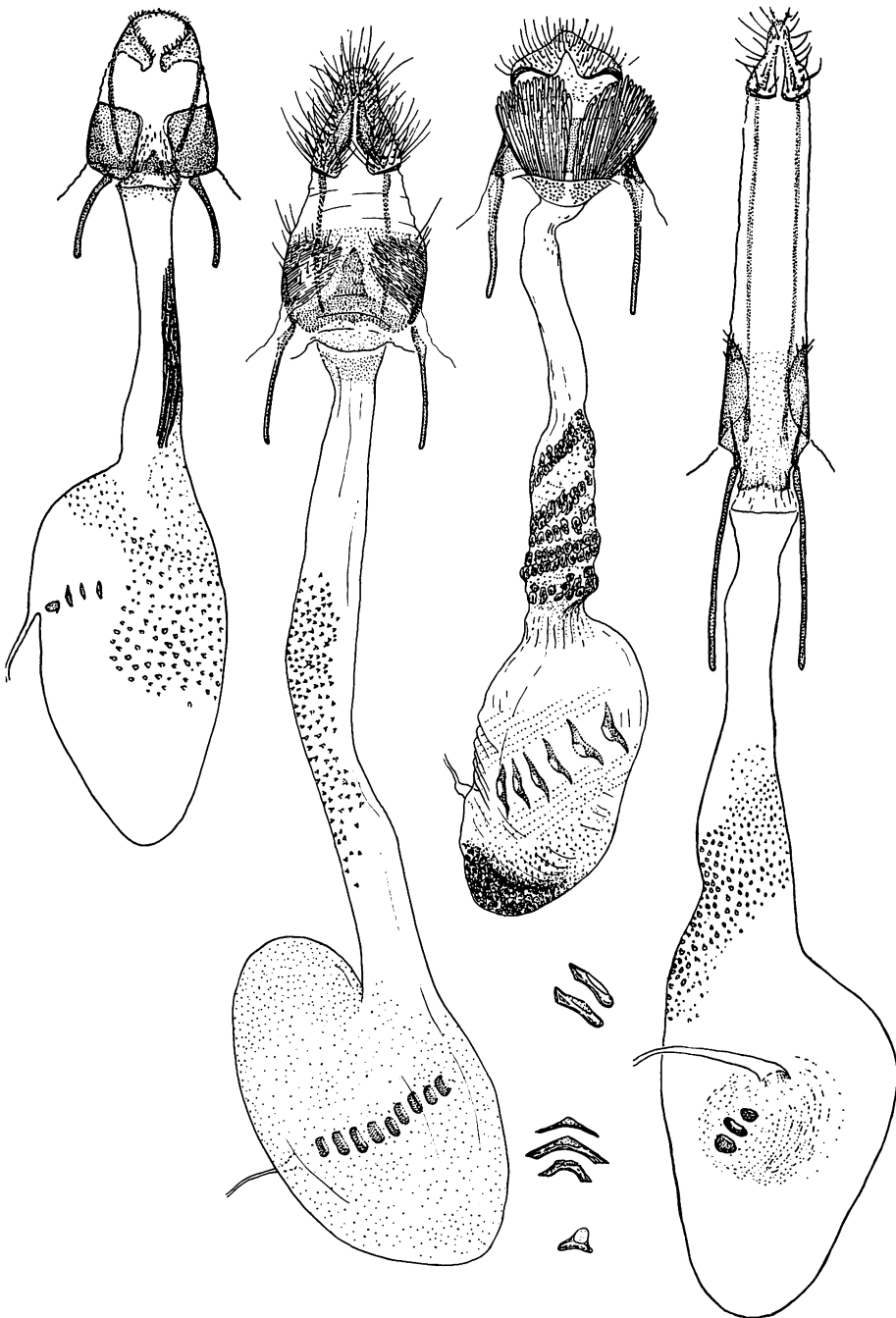


Figure 322—Female genitalia. From left to right: *Ephestia cautella* (Walker), *Ephestia elutella* (Huebner), *Ephestia figulilella* Gregson, and *Anagasta kuhniella* (Zeller). The inset shows variations of the signa of *Anagasta kuhniella* (Zeller). Figures kindly loaned from the manuscript of Heinrich, 1956, by J. F. Gates Clarke, U. S. National Museum.

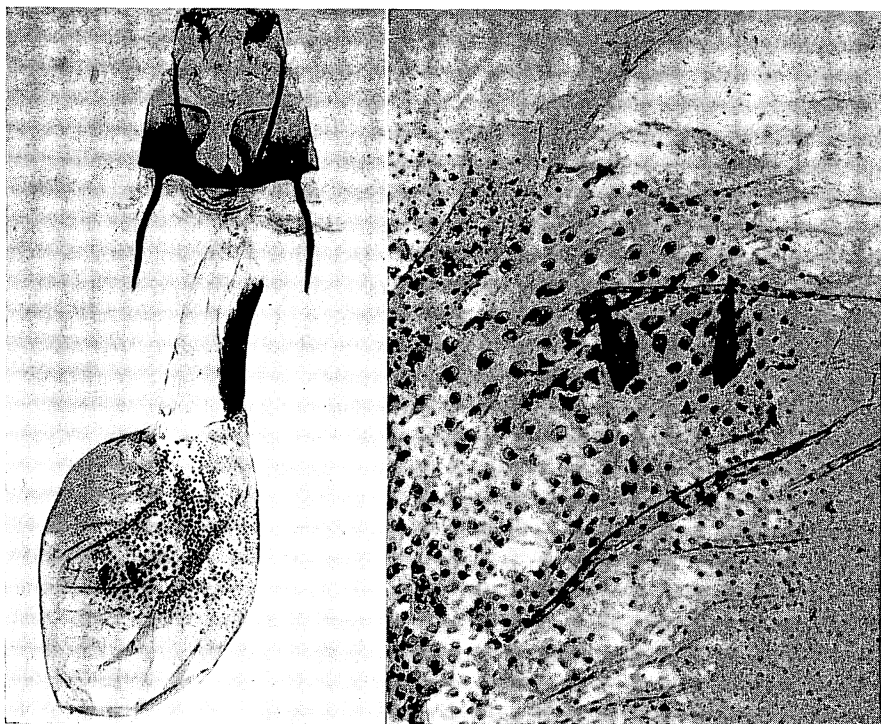


Figure 323—*Ephestia cautella* (Walker). Female genitalia; England.

For a detailed description and extensive discussion of this species, see Richards and Thomson (1932:205). For details of the anatomy of the male and female genitalia, see Norris (1932:595). For details of the larva, see Hinton (1942:21) and Peterson (1948:208, figs. L49, A–D). For scent glands, see Dickens (1936).

As noted under *Ephestia*, according to Mosher (1916), the pupae of *Plodia* can be distinguished from *Ephestia* because the abdominal segments are smooth and the maxillae do not reach the apices of the wings.

Family PTEROPHORIDAE

Alucitae Linnaeus, 1758:496, 542, in part. Scopoli, 1763:256, in part.

Pterophorii Latreille, 1802:418; 1803:325; 1805:255; all in part.

Pterophorites Latreille, 1809:192, 233; 1810:442; all in part.

Alucitides Leach, 1815:135, in part.

Alucitidae Curtis, 1821:161, in part. Stephens, 1835:369, in part. Hampson, 1918:386.

Pterophoridae Zeller, 1841:754.

Barnes and Lindsey, 1921. Fernald, 1898. Fish, 1881. T. B. Fletcher, 1909, 1926. Meyrick, 1886, 1910, 1913.

The Plume Moths

In this family the maxillary palpi, ocelli and chaetosemae are absent. On the under side of the middle lobe of the hind wings of some of the species examined,

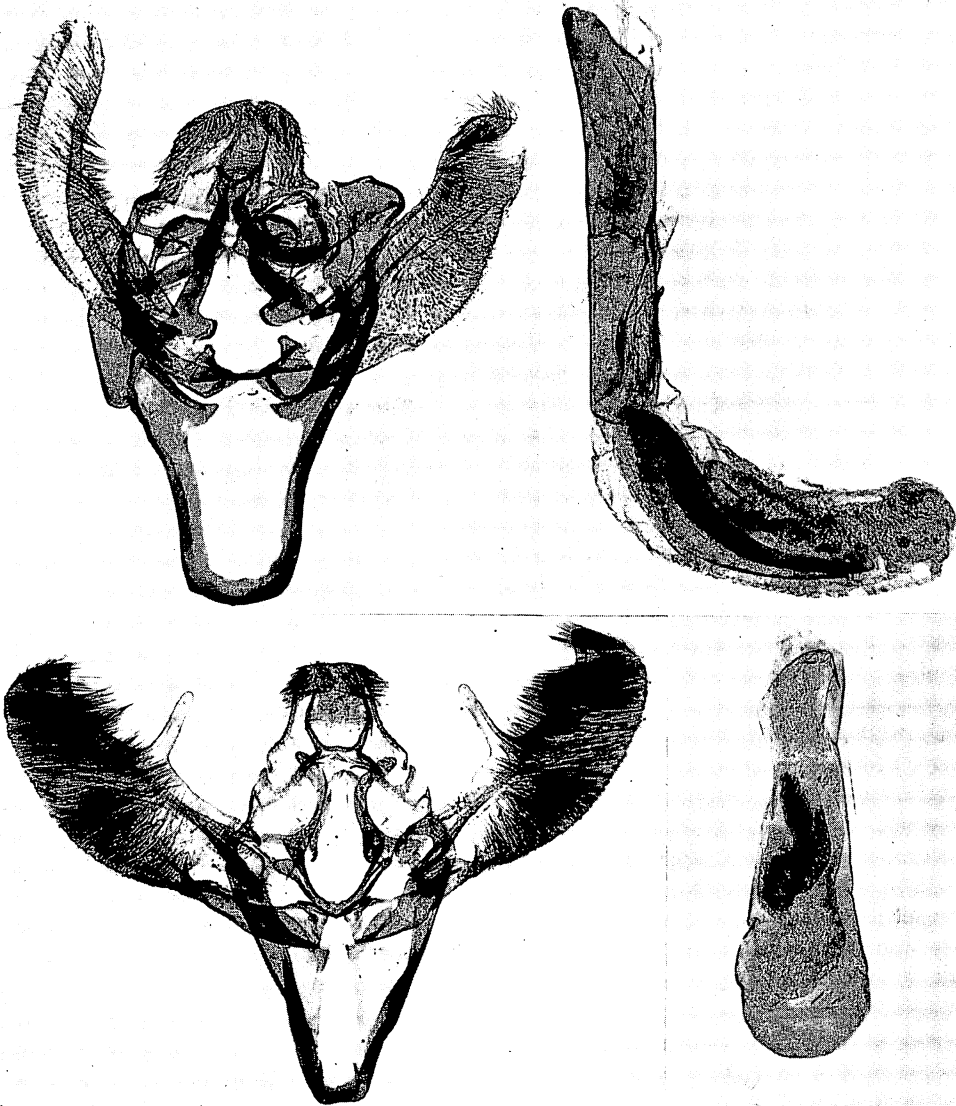


Figure 324—Above: Male genitalia of *Ephestia elutella* (Huebner); Borneo; aedeagus upside down with internal sac extruded at bottom. Below: Male genitalia of *Ephestia figulilella* Gregson; Iraq.

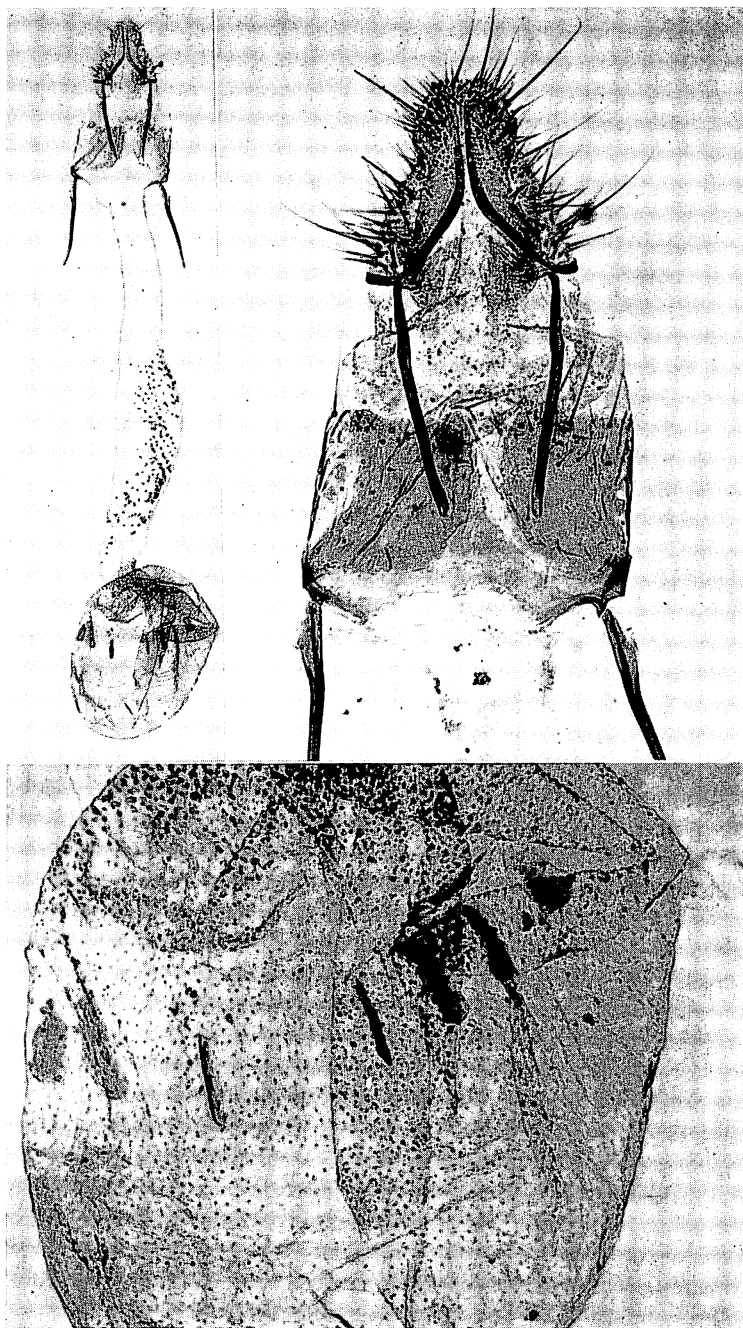


Figure 325—Female genitalia of *Ephesia elutella* (Huebner); Borneo.

there are some peculiar, specialized scales (not to be confused with the larger and more conspicuous specialized scales in the fringe of the hind lobe of some species). Some texts refer to these scales as black, but ours are reddish. The scales may persist even after the wings are treated, descaled and cleared for venational studies. The fore wings have two lobes, and the hind wings have three lobes. The male genitalia of some species are assymetrical, but our species all have symmetrical genitalia.

My study of the few species found in Hawaii has revealed the utter chaos which exists in the classification of this interesting family; it is astonishing. The genitalia offer excellent characters for the separation of many genera and species, and one wonders why adequate attention has not been given them.

Our species generally have been referred to *Platyptilia* and *Trichoptilus*, but neither genus occurs in Hawaii. Our species heretofore referred to *Trichoptilus* is the type of *Megalorhipida* Amsel. The type of *Platyptilia* (*gonodactyla* Denis and Schiffermueller) has a heavy tuft on its head, the first segment of the hind tarsus is longer than segments 2 to 5 inclusive, and the genitalia are very different from any species occurring in Hawaii. *Platyptilia* has a long list of supposed synonyms. I have examined the following genera which have been listed as synonyms: *Amblyptilia* Huebner (type: *acanthodactyla* Huebner), *Cnemidophorus* Wallengren

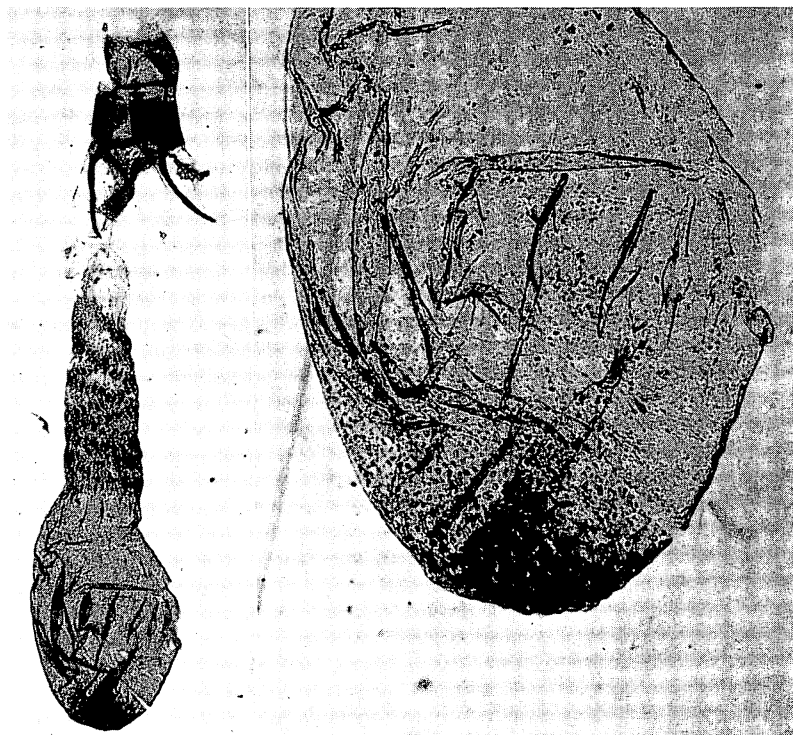


Figure 326—Female genitalia of *Ephesia figulilella* Gregson.

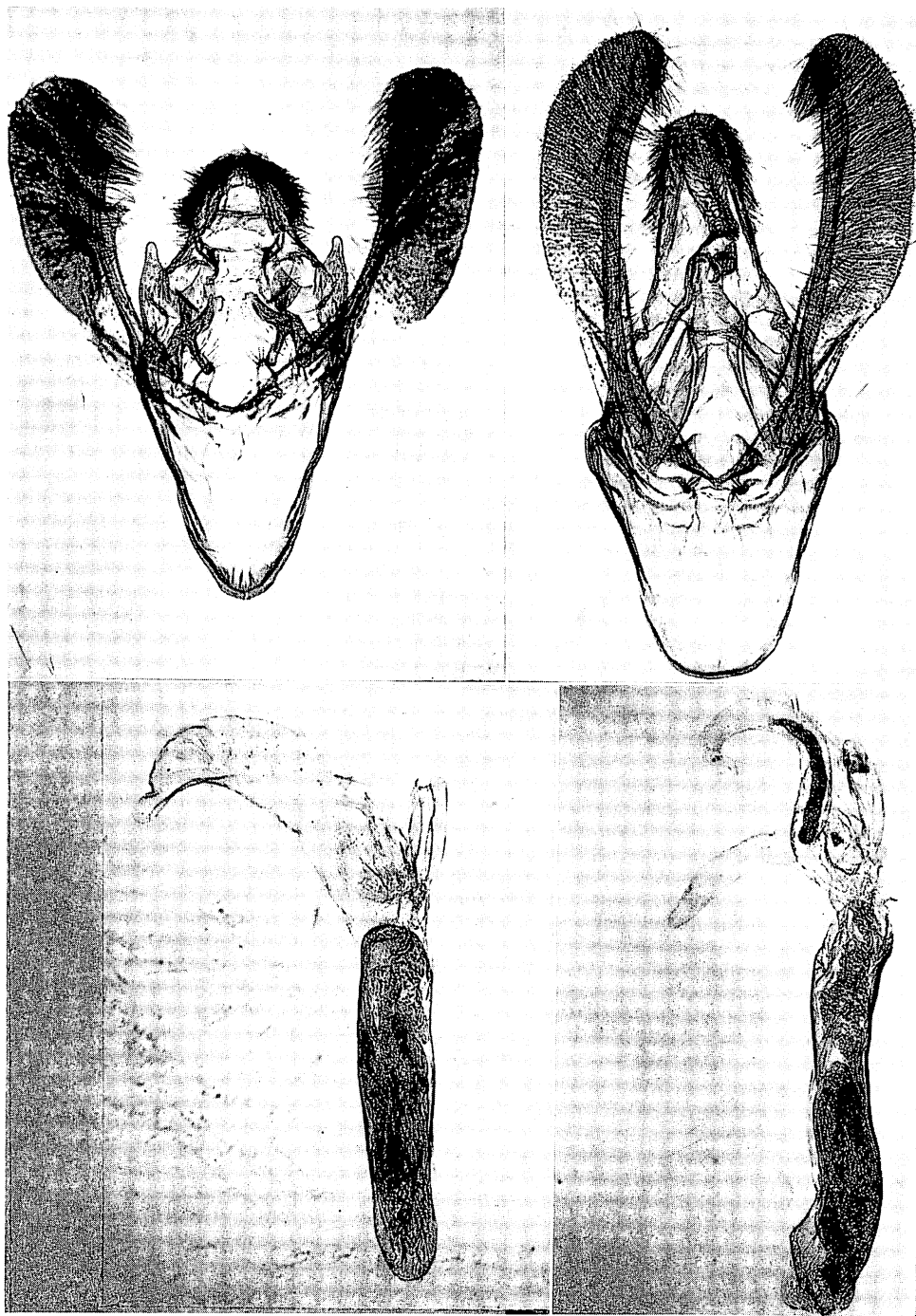


Figure 327—Male genitalia of *Ephestia cautella* (Walker) (left) and of *Anagasta kuhniella* (Zeller) (right). Courtesy of J. D. Bradley and British Museum (Nat. Hist.).

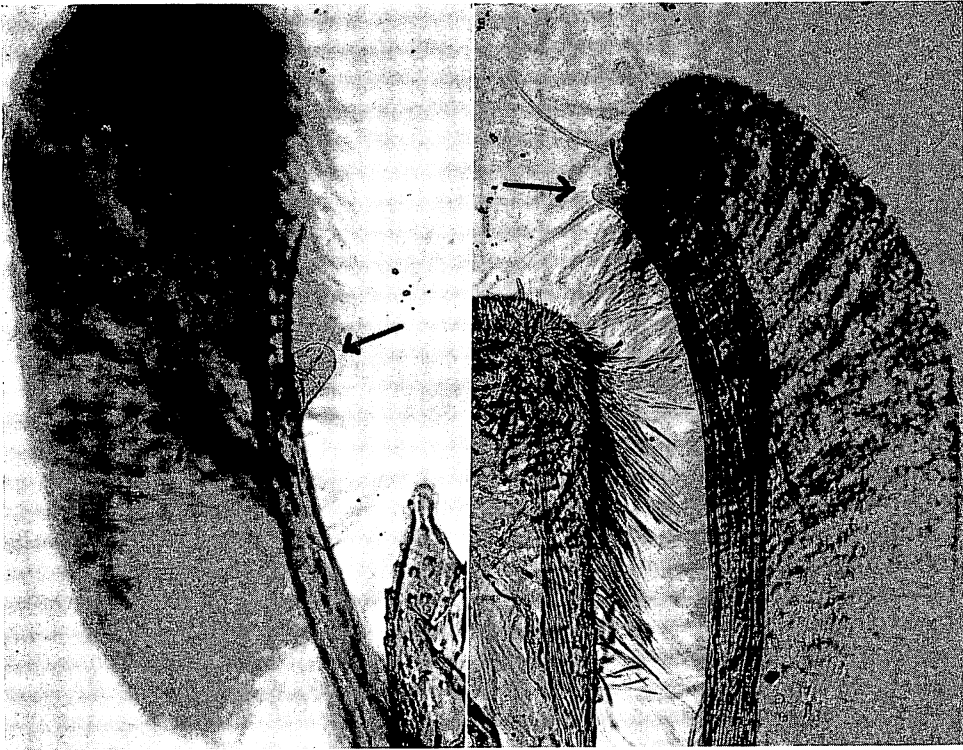


Figure 328—Parts of the valves of the male genitalia of *Ephestia cautella* (Walker) (left) and *Anagasta kuhniella* (Zeller) (right), to show the thumb-like protuberance on the costa. These photographs were taken from the dorsal sides of the preparations shown in figure 327. Courtesy of J. D. Bradley, British Museum (Nat. Hist.).

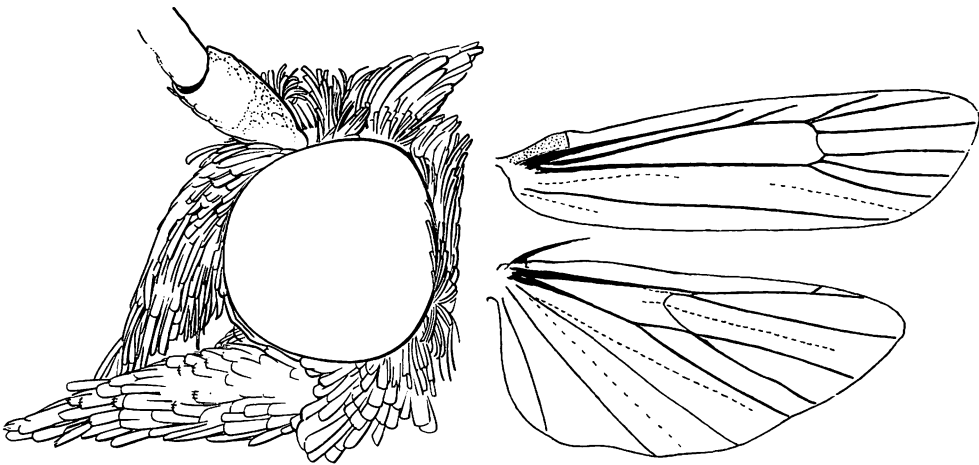


Figure 329—Head and wing venation of *Plodia interpunctella* (Huebner); the vestige of vein 8 may not be evident on some examples.

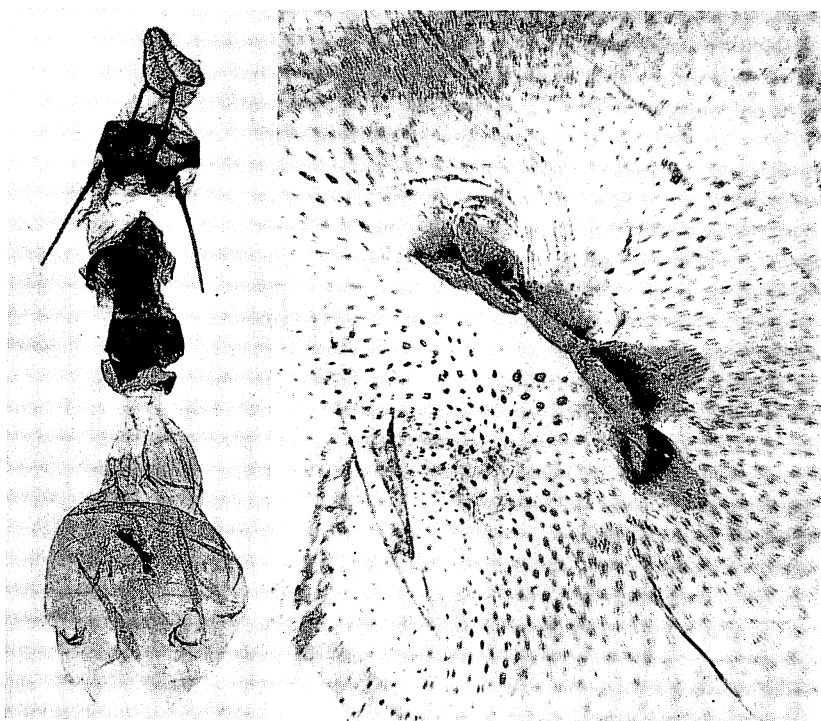


Figure 330—Female genitalia of *Plodia interpunctella* (Huebner) with the signum enlarged; an Australian example.

(type: *rhododactyla* Denis and Schiffermueller), *Walsinghiamiella* Berg (*Gilbertia* Walsingham) (type: *eques* Walsingham), *Crocodyoscelus* Walsingham (type: *ferugineus* Walsingham), and *Sonchora* Walker (type: *donatella* Walker). It appears to me that all of these are good genera, and perhaps there are many characters whereby they may be differentiated.

The pupae of many species display excellent character differences, but, unfortunately, I have not had a collection of pupae available for study. The larvae are also distinctive.

It is virtually impossible to describe adequately the few genera which must be dealt with here, because a world-wide revision is required and new evaluation of all characters is necessary. In this text I can only give brief diagnoses and call attention to some of the differentiating features. I must leave the group in an unsatisfactory state, and much work remains to be done.

KEY TO THE GENERA OF PTEROPHORIDAE FOUND IN HAWAII

1. Cleft of fore wing extending to or basad of middle of wing;
lobes of both fore and hind wings very slender; not
more than eight veins distinguishable in fore wings. .
..... **Megalorhipida.**

- Cleft of fore wing not extending more than one-third length of wing; lobes of fore wing moderately wide, as illustrated; fore wings with twelve veins distinguishable. . . 2
- 2(1). Hind lobe of hind wing without any dark, heavy, modified scales along hind margin; mesoscutellum gently convex, not declivitous behind. **Lioptilodes.**
- Hind lobe of hind wing with distinct, dark, broad, modified scales along hind margin, forming clusters in some species; mesoscutellum either gently convex or declivitous behind. 3
- 3(2). First segment of hind tarsus only about one-half as long as other four tarsal segments combined; mesoscutellum only gently convex, not elevated and not declivitous behind; broad, modified scales of hind lobe of hind wing along both fore and hind margins and forming a dense cluster near apex of hind margin. . **Lantanophaga.**
- First segment of hind tarsus obviously more than one-half as long as remainder of tarsus; mesoscutellum inflated and bulbose, strongly declivitous behind; broad, modified scales of hind lobe of hind wing confined to posterior edge and either not condensed in any strong clusters, or larger cluster is not subapical. 4
- 4(3). First hind tarsal segment obviously shorter than segments 2 to 5 combined, only about as long as 2 plus 3. **Anstenoptilia.**
- First hind tarsal segment subequal in length to segments 2 to 5 inclusive, obviously longer than segments 2 plus 3. **Stenoptilodes.**

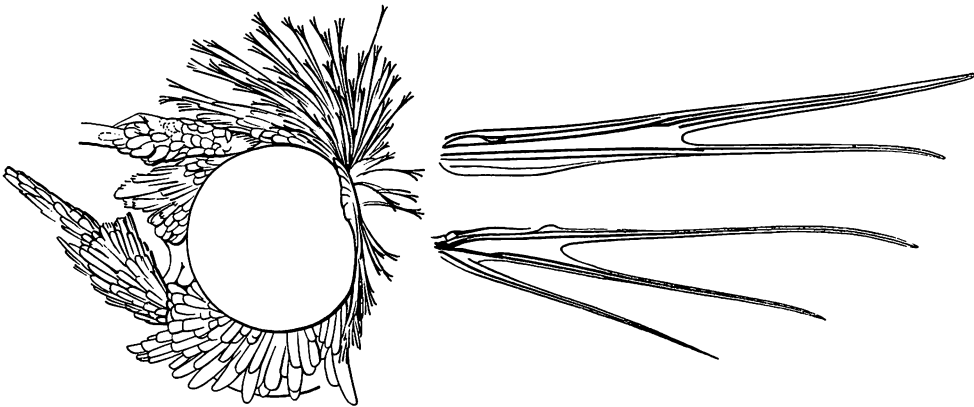


Figure 331—Head and wing venation of *Megalorhipida defectalis* (Walker).

We may further summarize the characters of the genera as follows: In the present fauna, any specimen which has the cleft in the fore wing extending to the middle of the wing belongs to *Megalorhipida*. The other four genera, all of which have the cleft in the fore wing extending into the wing for not more than one-third its length, may be divided into two groups by observing the longitudinal dorsal contour of the mesoscutellum—if it is gently convex and does not rise abruptly and far above the metanotum, then the species belong either to *Lioptilodes* or *Lantanophaga*. If, however, the mesoscutellum is inflated and bulbous and its hind margin is steeply declivitous, the genera involved are *Anstenoptilia* and *Stenoptilodes*. Fresh specimens of *Lioptilodes* are easily separated from *Lantanophaga* because they have no large, modified scales on the hind margin of the posterior lobe of the hind wing, whereas such scales are well developed on *Lantanophaga*. Badly rubbed examples of *Lantanophaga* may easily be confused with *Lioptilodes* if these scales are abraded, but *Lantanophaga* has unusually long spurs

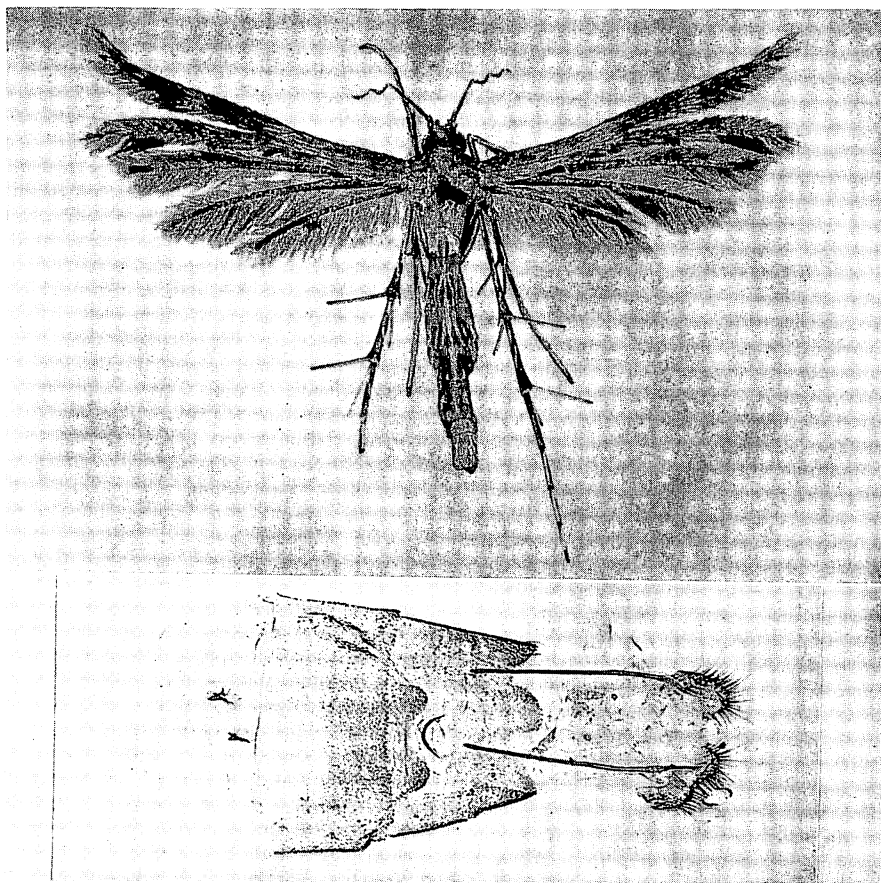


Figure 332—*Megalorhipida defectalis* (Walker); Koko Crater, Oahu; reared from *Boerhaavia*; right fore wing 6.75 mm. long. Below: Part of the female genitalia of a specimen from Ceylon (see also the other figure of female genitalia.)

on the hind tibiae (the longest spurs are only moderately shorter than the distance between the two pairs of spurs), and once the difference in spur development is learned, these two groups can be separated even if they are badly abraded. *Stenoptilodes* has a long first hind tarsal segment which is about as long as the remainder of the tarsus, whereas it is much shorter than the remainder of the tarsus in *Anstenoptilia*. *Anstenoptilia* also has the large, modified, dark scales along the hind margin of the hind lobe of the hind wing condensed into a cluster at about the apical third, but *Stenoptilodes* has few such scales much beyond the middle and no cluster of scales at the apical third.

Our *Megalorhipida* and *Stenoptilodes* have come from the Old World; our *Lioptilodes*, *Lantanophaga* and *Anstenoptilia* have come from America.

Genus **MEGALORHIPIDA** Amsel, 1935:293

This genus is quite distinct from any other in Hawaii, and it is easily recognized once the diagnostic features, as noted in the key, are learned.

Megalorhipida defectalis (Walker) (figs. 331, 332, 343, 345).

Pterophorus defectalis Walker, 1864:943.

Trichoptilus defectalis (Walker) Fletcher, 1910:312; 1926:621, fig. 10.

Buckleria defectalis (Walker) Fletcher, 1910:398; 1920:6, pl. 1, fig. 1.

Pterophorus congrualis Walker, 1864:943.

Trichoptilus congrualis (Walker) Fletcher, 1926:622.

Pterophorus oxydactylus Walker, 1864:944.

Trichoptilus oxydactylus (Walker) Walsingham, 1907:471, pl. 10, fig. 3. Perkins, 1913:clxii. Fletcher, 1926:623.

Aciptilia hawaiiensis Butler, 1881:408.

Trichoptilus hawaiiensis (Butler) Meyrick, 1888:239.

Trichoptilus ochrodactylus Fish, 1881:142.

Trichoptilus centetes Meyrick, 1886:16.

Trichoptilus compsochares Meyrick, 1886:16.

Trichoptilus ralumensis Pagenstecher, 1900:239.

Megalorhipida palästinensis Amsel, 1935:293, pl. 10, fig. 27.

Megalorhipida defectalis (Walker) Adamczewski, 1951:382.

Kauai, Oahu, Molokai, Maui (probably also on Lanai and Hawaii), Nihoa, Laysan, French Frigate Shoal, Midway, Jarvis.

Immigrant. Described from Africa. Very widespread in the warmer regions of the world. First found in Hawaii by Blackburn and recorded in 1881 by Butler.

Hostplant: *Boerhaavia diffusa*.

The flight of this lowland and littoral species reminds me of the flight of *Chrysopa*, and the moths may easily be confused with *Chrysopa* when flying. The

adults are often extremely abundant where *Boerhaavia* grows. The larvae are spiny.

In 1913, Meyrick used the specific name *congrualis* for this species, but Fletcher had chosen *defectalis* in 1910. Both names appear on the same page in Walker's catalog, and it does not matter if one chooses to use page priority or first reviser's choice, *defectalis* has precedence over *congrualis*.

I have checked the types of *congrualis*, *defectalis*, *oxydactylus* and *hawaiiensis* and the synonymy appears quite correct.

Genus **LIOPTILODES**, new genus

Side view of head, palpi, wing shape and venation as illustrated. Front of head tumid, longitudinal contour nearly convex from a line between anterior edges of bases of antennae to apex, the scales peaked in front and not appressed. Mesoscutellum gently convex, sloping gently ventro-caudad to metanotum, its contour only slightly discontinuous with metanotum and its posterior part not declivitous and not rising much above metanotum. Hind wing without any dark, modified scales along hind margin of posterior lobe (or elsewhere), and none on posterior lobe of fore wing. Hind legs with the distance between the two pairs of spurs less than the length of a first tarsal segment; first hind tarsal segment somewhat longer than remainder of tarsus. Genitalia as illustrated.

Type of the genus: *Lioptilus* ? *parvus* Walsingham. Gender of *Lioptilodes*: masculine.

Walsingham (1880:56-57) said, when describing the type, "It differs in its palpi from the genus *Lioptilus*, but does not agree in its remaining characters with any other genus of the Pterophoridae. . . . It may possibly become the type of a new genus when the North-American representatives of this family have been more completely studied; but I shall not venture to found one upon the single specimen before me." I have been unable to find a described genus to include the type species.

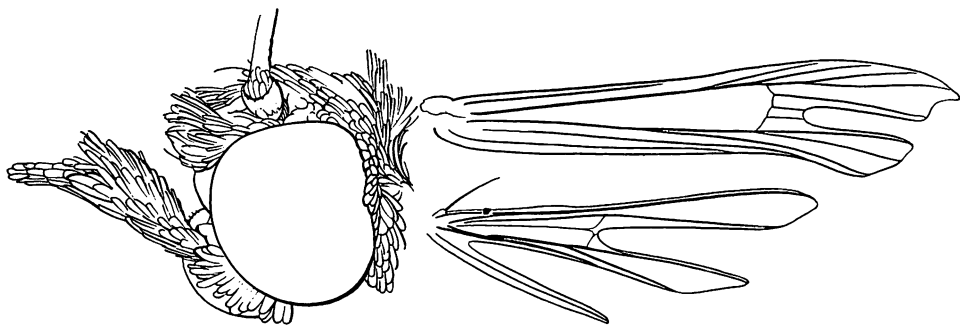


Figure 333—Head and wing venation of *Lioptilodes parvus* (Walsingham).

Lioptilodes parvus (Walsingham), new combination (figs. 333, 334, 343, 345).

Lioptilus ? parvus Walsingham, 1880:55, pl. 3, fig. 12.

Pterophorus parvus (Walsingham) Fernald, 1898:48. Meyrick, 1910:17.

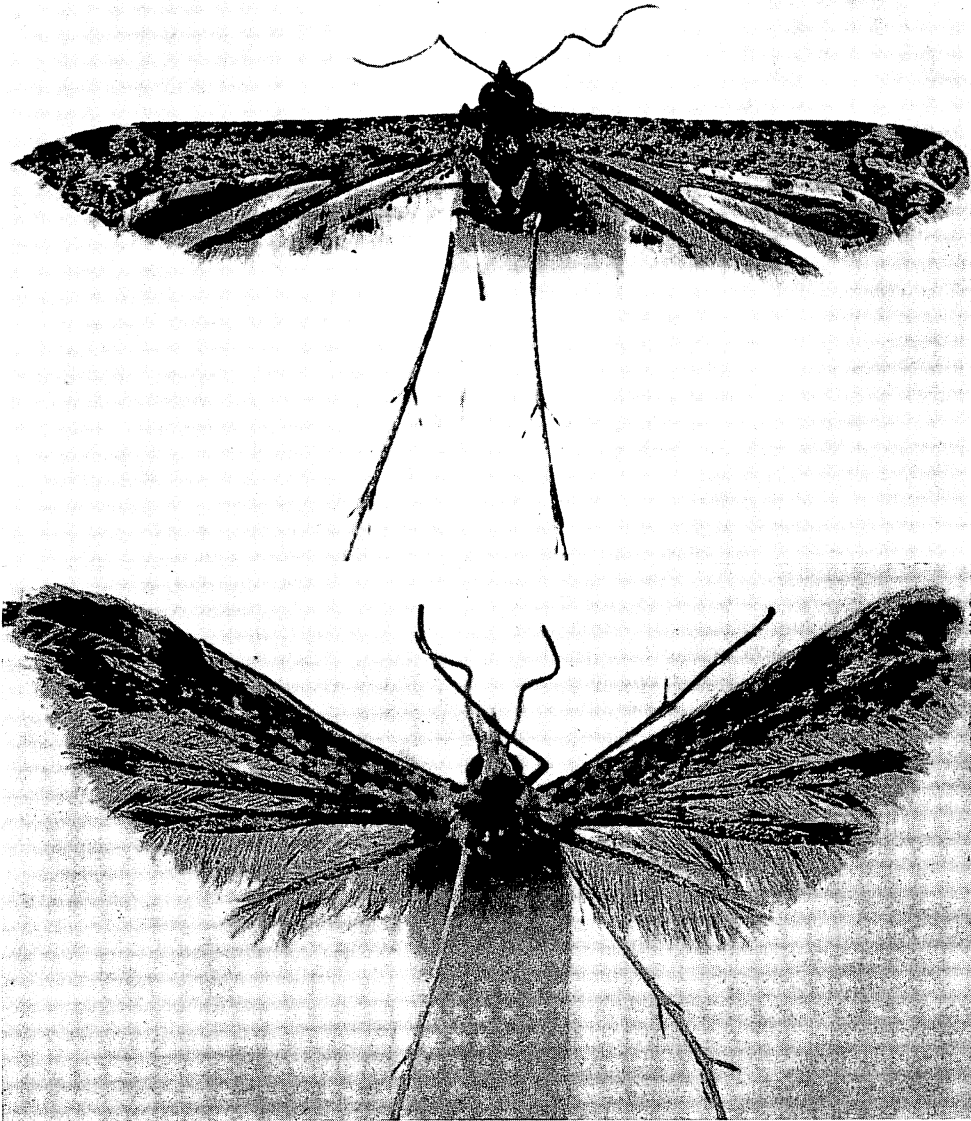


Figure 334—Above: *Anstenoptila marmorodactyla* (Dyar). A male from the Waianae Mts., Oahu, 1,600 feet; expanse, 17 mm. Below: *Lioptilodes parvus* (Walsingham), the type female; Mt. Shasta, California; expanse, 13 mm.

Oahu, Hawaii.

Immigrant. Described from a single female from Mount Shasta, California. Meyrick's series includes examples from Texas, New Mexico and southern California. First recorded in Hawaii by Swezey in 1952 from specimens taken as early as 1946 at Kilauea, Hawaii, and the Pearl Harbor area on Oahu. The identification was made by me at the British Museum, where I compared Hawaiian specimens with the type, including a comparison of the genitalia.

Hostplant: *Erigeron albidus*.

Badly abraded specimens of *Lantanophaga pusillidactyla* may be confused with this species, but *pusillidactyla* have much longer spurs on the hind legs.

Genus **LANTANOPHAGA**, new genus

Side of head, palpi, wing shape and venation as illustrated. Front of head, as seen from side, moderately tumid, the highest point beyond middle, scales closely appressed to the contour and not peaked. Mesoscutellum only gently convex, nearly horizontal in dorsal contour, not elevated and not declivitous behind, and the contour is subcontinuous with that of the metanotum. Hind wing with the hind lobe with large, dark, modified scales along posterior margin and also forming a cluster near or at the apex of the posterior margin, and also with some of the specialized scales on the anterior margin of the hind lobe, and patches of the modified scales along the hind margin of the posterior lobe of the fore wing. Hind legs with the distance between the two pairs of spurs less than the length of the first two hind tarsal segments, spurs long, the longest spur four-fifths as long as the distance between the two pairs of spurs in the type species; first segment of hind tarsus shorter than segments 2 plus 3. Genitalia as illustrated.

Type of the genus: *Oxyptilus pusillidactylus* Walker. Gender of *Lantanophaga*: feminine.



Figure 335—Head and wing venation of *Lantanophaga pusillidactyla* (Walker).

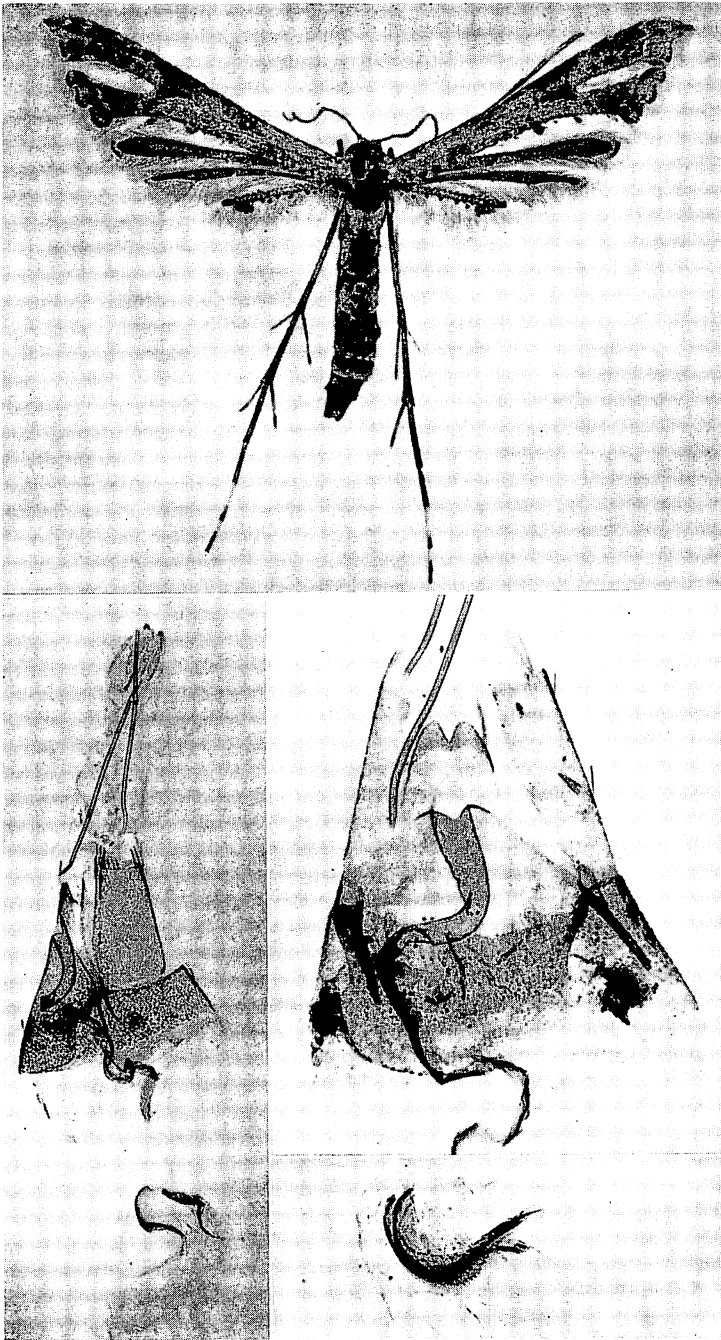


Figure 336—*Lantanophaga pusillidactyla* (Walker). Above: A specimen from Honolulu; right fore wing 5.75 mm. long. Below: Genitalia of a female from Ceylon (ostium in lateral view) (left); ostium and adjacent areas and signum (below) of another female from Ceylon.

It is probable that a number of American species will be assigned to this genus when they are studied more carefully, but it is beyond the scope of the present work to review them here.

***Lantanophaga pusillidactyla* (Walker), new combination** (figs. 335, 336, 343).

Oxyptilus pusillidactylus Walker, 1864:933. Fletcher, 1926:607.

Platyptilia technidion Zeller, 1877:468, pl. 6, fig. 162.

Platyptilia hemimetra Meyrick, 1886:18.

Platyptilia pusillidactyla (Walker) Fletcher, 1909:13, pl. A, fig. 2; 1914:444, fig. 321; 1920:19, col. pl. 4. Swezey, 1924:77, fig. 78, adult and larva.

Platyptilia lantana Busck, 1914:103.

The lantana plume moth.

Kauai, Oahu, Molokai, Maui, Lanai, Hawaii.

Introduced purposely from Mexico by Koebele about 1902 as an aid in controlling *Lantana*. Described from Jamaica and now widely spread in the tropics and subtropics of the world.

Hostplant: *Lantana*.

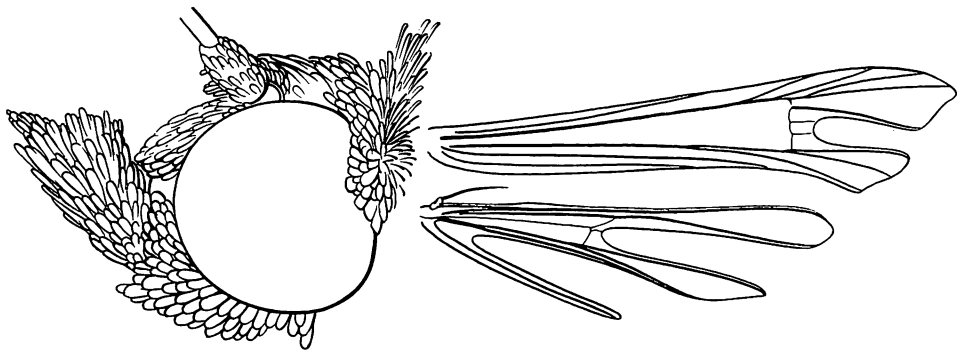


Figure 337—Head and wing venation of *Anstenoptila marmorodactyla* (Dyar).

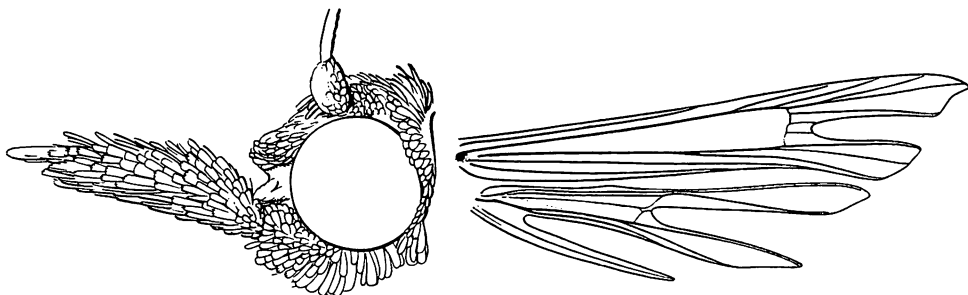


Figure 338—Head and wing venation of *Stenoptilodes littoralis rhynchophora* (Meyrick).

The caterpillars feed in the flower clusters of lantana, thus reducing the seeding capacity of the plant and aiding in its control. Fletcher (1914:444) speaking of the species in India, said "Beneficial in Districts invaded by Lantana. Where attacked by this caterpillar bunches of fruit contain only a few shrivelled fruits instead of a dozen or more plump ones. This little moth is therefore a factor of some importance in checking the spread of Lantana through the dispersal of the seeds by Birds." Also see Fletcher (1920:19) for colored plate and biology. Swezey (1924:77) said "The eggs of the plume moth are laid singly on the bracts in the

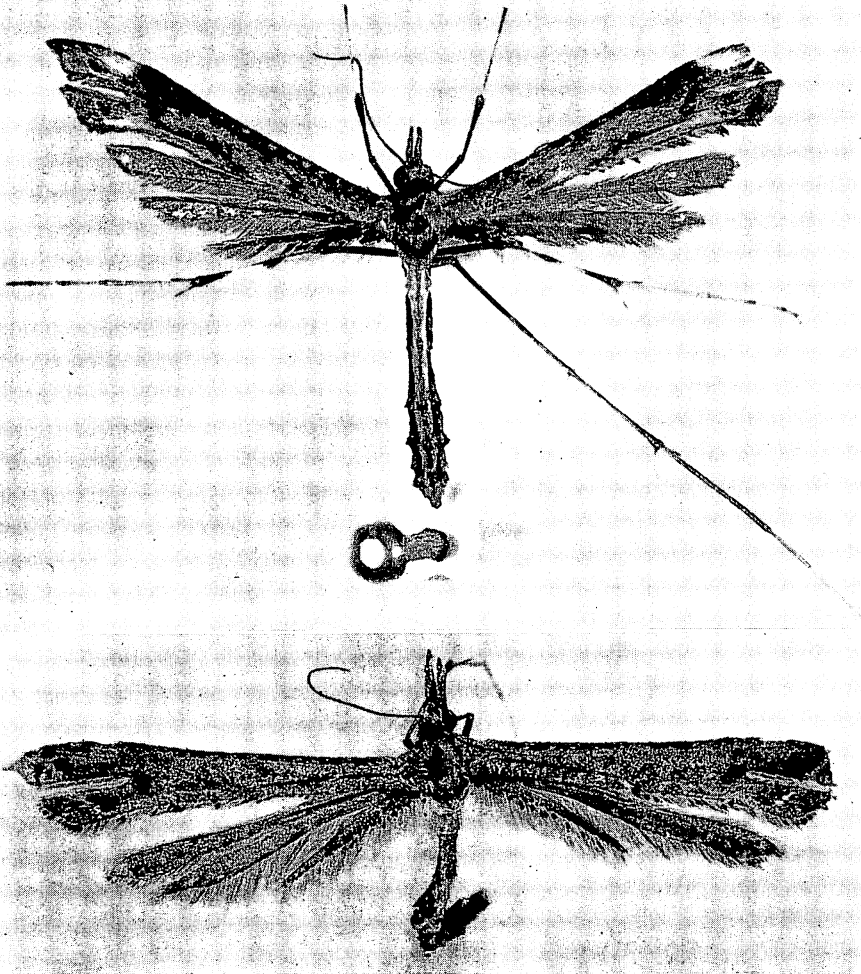


Figure 339—*Stenoptilodes*. Above: *littoralis littoralis* (Butler), type; "Hawaiian Islds. 81-9 169" (Blackburn); expanse, 20 mm. Below: *littoralis rhynchophora* (Meyrick); Pauoa, Oahu; expanse, about 19 mm.

flower cluster. The larva is whitish and it pupates in the place where it had fed." Fletcher (1909:13-14) described the egg, larva and pupa.

The holotype, in the British Museum, has been damaged badly by insect pests and has lost its head and has most of the abdomen, including the genitalia, eaten away.

Genus **ANSTENOPTILIA**, new genus

Side of head, palpi, wing shape and venation as illustrated. Front of head, in side view, protuberant, sloping up from a line between the bases of the antennae to reach its most protuberant point just before rounding off to the apex, the scales closely appressed and not peaked. Mesoscutellum inflated, high and bulbose, rising abruptly above metanotum, its posterior part high and strongly declivitous. Hind wing with conspicuous, dark, modified scales along posterior margin of hind lobe, these scales scattered from base to about two-thirds the length of the lobe where they are condensed into a conspicuous cluster at about the apical third; posterior margin of fore wing also with some similar specialized scales. Hind legs with the distance between the two pairs of spurs only slightly less than the length of the first tarsal segment; first hind tarsal segment about as long as segments 2 plus 3. Genitalia as illustrated.

Type of the genus: *Platyptilia marmorodactyla* Dyar. Gender of *Anstenoptilia*: feminine.

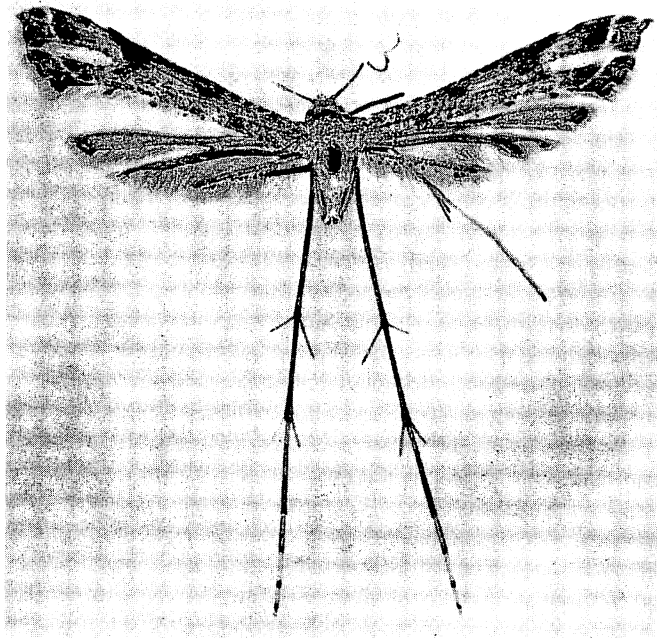


Figure 340—*Stenoptilodes taprobanes brachymorpha* (Meyrick); Koko Crater, Oahu; reared from *Plectranthus*; right fore wing 6 mm. long.

Anstenoptilia marmorodactyla (Dyar), **new combination** (figs. 334, 337, 344, 345).

Platyptilia marmorodactyla Dyar, 1902:442.

Platyptilia fuscicornis of Walsingham, 1907:472, pl. 10, fig. 4, not of Zeller.

Kauai, Oahu, Molokai, Maui, Lanai, Hawaii.

Immigrant; described from California and northern Mexico. First found in Hawaii on Haleakala, Maui, by Blackburn and recorded in error by Butler (1881: 407) as *Amblyptilia cosmodactyla* Huebner, variety.

Hostplants: *Ageratum conyzoides*, *Lantana*.

This species has appeared in Hawaiian literature as *Platyptilia fuscicornis* Zeller since Walsingham published his report in *Fauna Hawaiiensis* (1907:472, pl. 10, fig. 4). Walsingham was, however, in error in his determination. I have compared Hawaiian examples with Zeller's holotype, which is in a beautiful state of preservation in the British Museum. Although the Hawaiian species is closely similar in general facies to *fuscicornis*, the genitalia are widely distinct. Our material does, however, agree with *marmorodactyla* from San Diego, California.

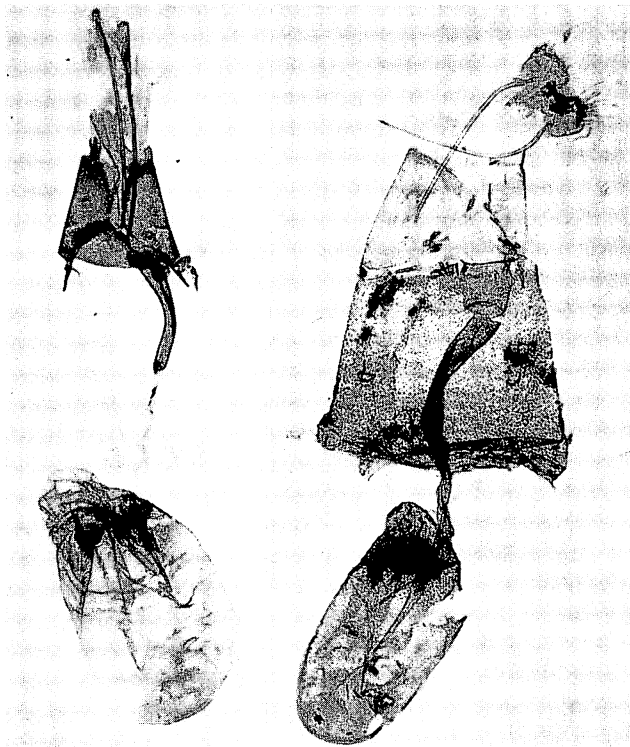


Figure 341—Female genitalia of *Stenoptilodes*. Left: The type of *littoralis littoralis* (Butler). Right: *taprobanes brachymorpha* (Meyrick); Oahu.

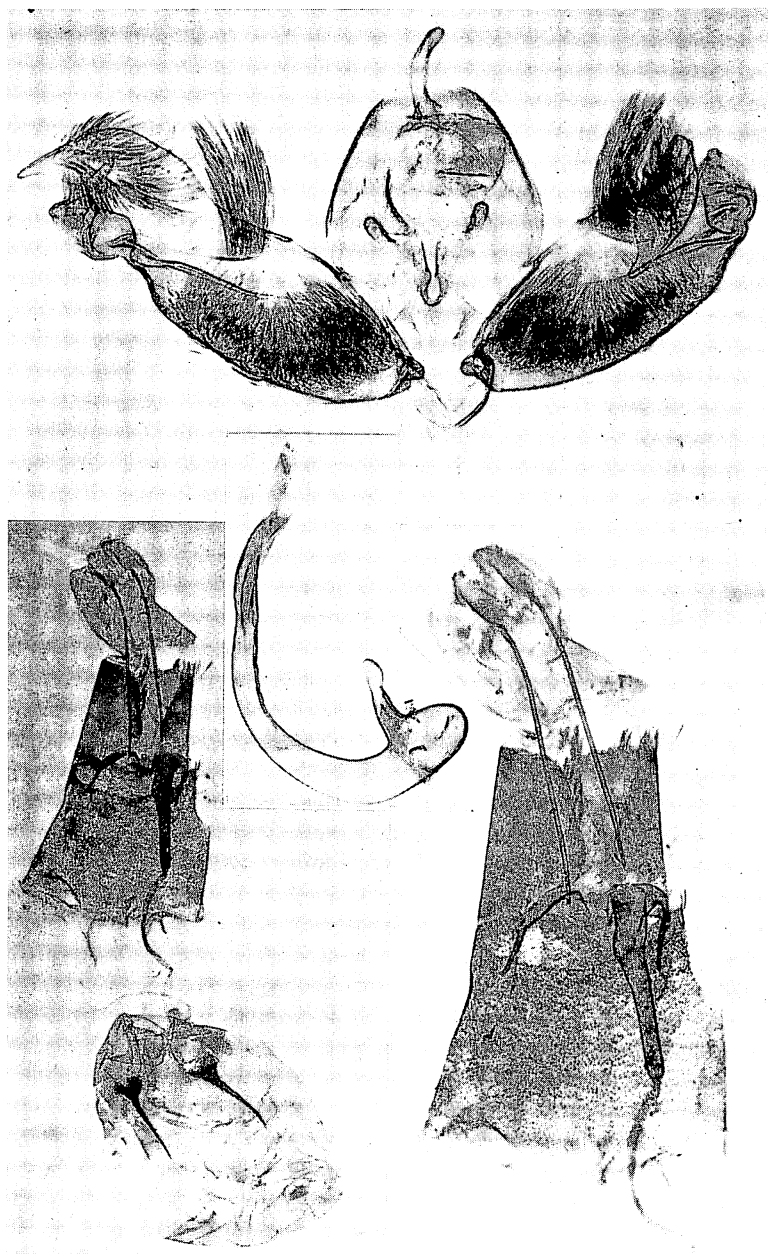


Figure 342—*Stenoptilodes littoralis rhynchophora* (Meyrick). Above: Male genitalia, with aedeagus inset in middle; this example has a deformed right valve (it is not asymmetrical; the left side is normal and the right side should be a mirror image; compare figure 344, *littoralis littoralis*); a specimen from Hawaii. Below: Female genitalia of an Oahu example.

Stenoptilodes littoralis littoralis (Butler), **new combination** (figs. 339, 341, 344). Type of *Stenoptilodes*.
Platyptilus littoralis Butler, 1882:44.
Platyptilia littoralis Butler, Meyrick, 1888:241. Walsingham, 1907:476, pl. 10, figs. 8, 9.

Kauai, Oahu (type locality: "Occurring on shores of a small mountain lake near Honolulu." [This must refer to the small lake which was once present in the crater of Mt. Tantalus.]), Molokai, Hawaii.

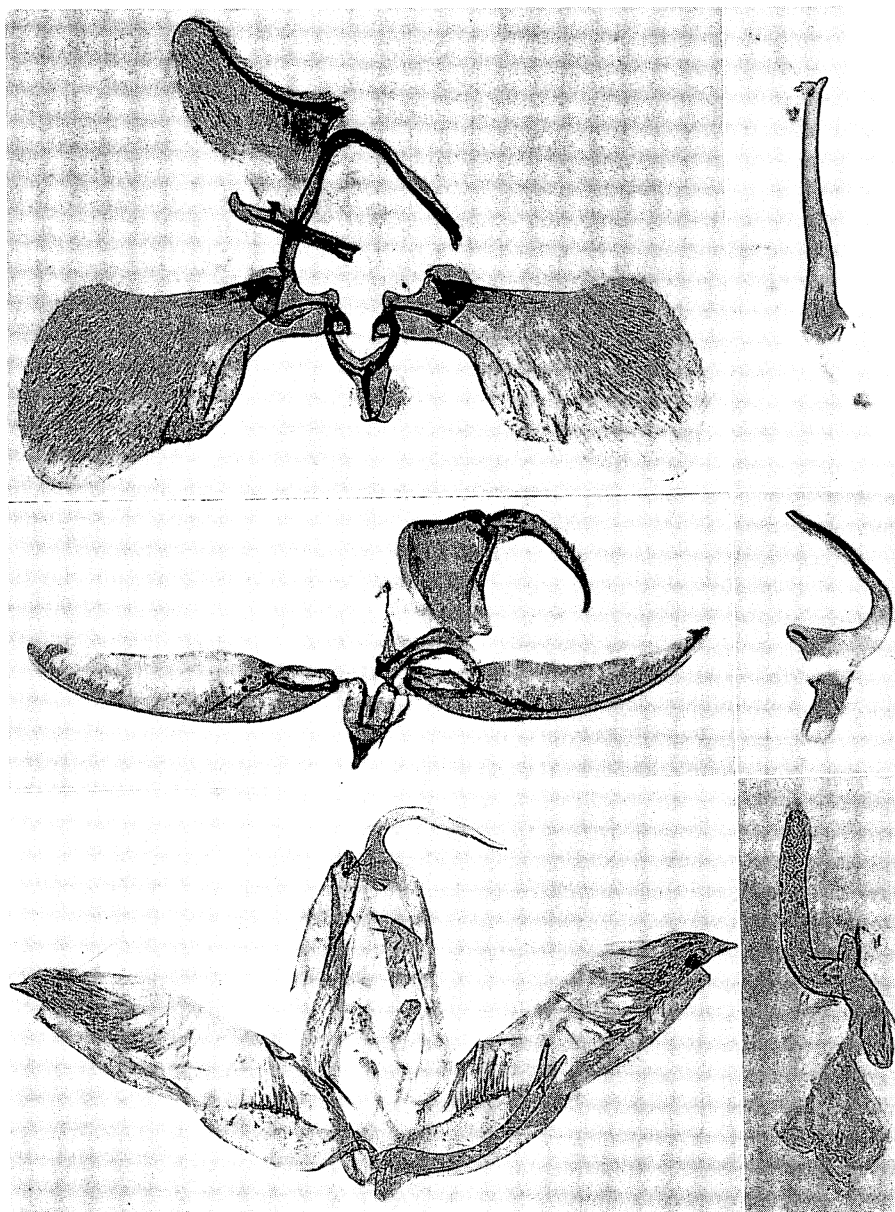


Figure 343—Male genitalia of Pterophoridae. Above: *Megalorhipida defectalis* (Walker); Oahu. Center: *Lioptilodes parvus* (Walsingham); Fort Dove, Texas. Below: *Lantanophaga pusillidactyla* (Walker); Constant Springs, Jamaica.

Immigrant?

Hostplant: *Geranium carolinianum australe*.

Butler's type in the British Museum is a female, but it is labeled male.

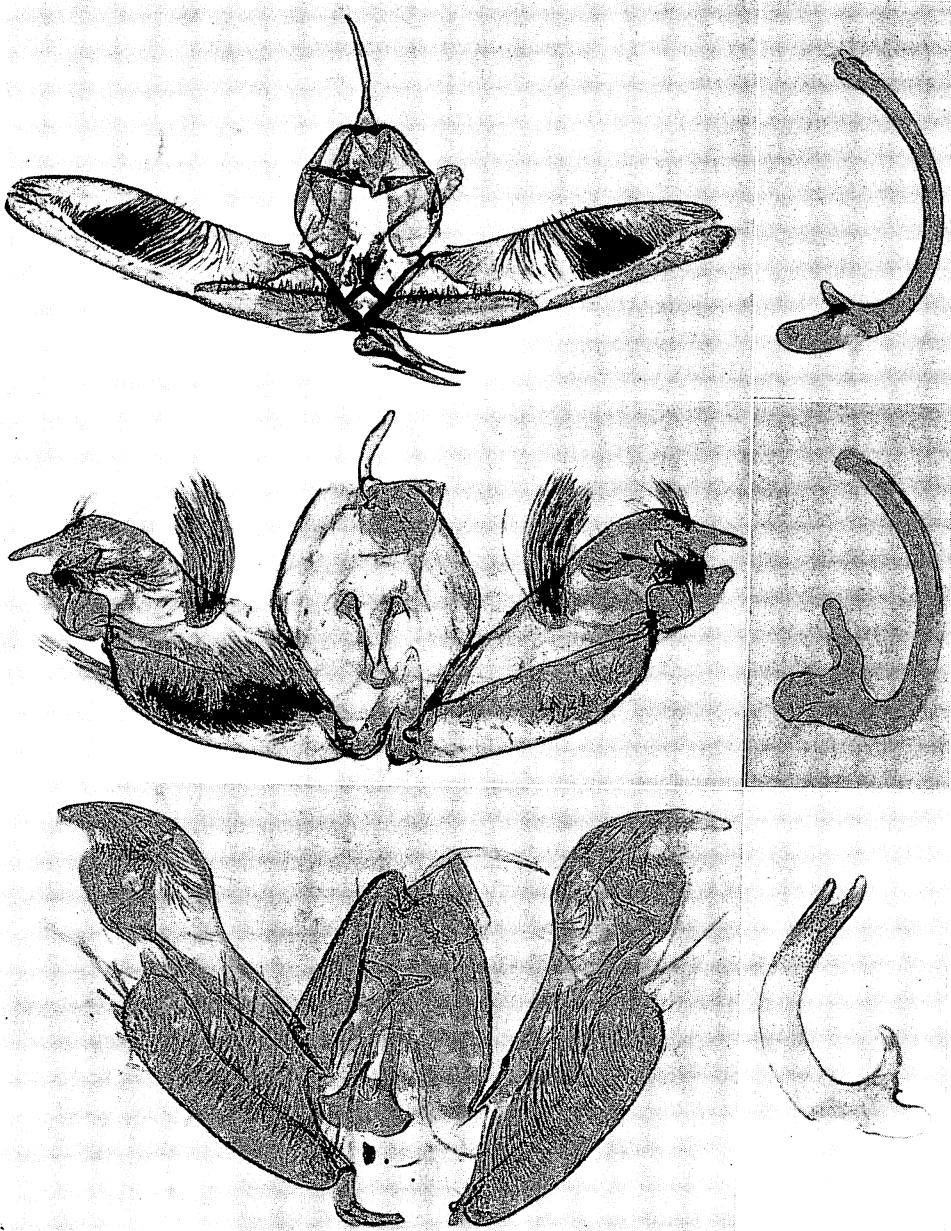


Figure 344—Male genitalia of Pterophoridae. Above: *Anstenoptila marmorodactyla* (Dyar); Lanai. Center: *Stenoptilodes littoralis littoralis* (Butler); Hawaii. Below: *Stenoptilodes taprobanes brachymorpha* (Meyrick); Hawaii (tip of left valve broken).

The genitalia of the material of this form examined are closely similar to *rhynchophora*, but they are slightly distinct; perhaps only a single, extremely variable species is involved here.

***Stenoptilodes littoralis* subspecies *rhynchophora* (Meyrick), new combination, new status** (figs. 338, 339, 342).

Platyptilia rhynchophora Meyrick, 1888:239. Walsingham, 1907:475, pl. 10, fig. 6.

Platyptilia repletalis, as a misidentification by Butler, 1881:407, not of Walker.

Platyptilia inceptrix Meyrick, 1913:111. **New synonym.**

Platyptilia insularis Walsingham, 1907:475, pl. 10, fig. 7. **New synonym.**

Kauai, Oahu, Molokai, Maui, Hawaii.

Immigrant?

Hostplants: "English plantain," *Vaccinium penduliflorum*, *Vaccinium reticulatum*, *Vaccinium* species.

Parasites: *Horogenes blackburni* (Cameron), *Hyposoter exiguae* (Viereck).

This is a highly variable insect. I have studied the types of *inceptrix* and *insularis* in detail, and I can only consider them to represent synonyms.

In Meyrick's collection I have located two examples taken by Blackburn in 1881. They are labeled simply "Hawaiian Is.," and I do not know what the exact type locality is. Meyrick did not label any type; I have designated one of the original Blackburn specimens, a male, as lectotype.

In his original description, Meyrick said that the palpi were four times as long as the length of an eye, but I have found great variation in the length of the palpi. Some examples have palpi which extend beyond the fore edge of the eye for a distance only slightly greater than the length of an eye; the palpi of others extend as much as three times the length of an eye in front of the eyes.

***Stenoptilodes taprobanes* subspecies *brachymorpha* (Meyrick), new combination, new status** (figs. 340, 341, 344).

Platyptilia brachymorpha Meyrick, 1888:240. Walsingham, 1907:474, pl. 10, fig. 5. Fletcher, 1920:21, pl. 3, fig. 2.

Kauai, Oahu, Molokai, Hawaii.

Immigrant? Although this form was described from Hawaii (exact type locality not indicated by Meyrick and not noted on label on lectotype), it is possibly an immigrant.

Hostplants: Basil, snapdragons, *Plectranthus*.

Parasite: *Pristomerus hawaiiensis* Perkins.

There is only one example taken by Blackburn in 1881 in Meyrick's series of this species. I have designated it lectotype, because no type was designated by Meyrick. Unfortunately, it has no abdomen.

The Felder type of *Stenoptilodes taprobanes*, **new combination** (*Amblyptilia*

taprobanes Felder, 1875), now in the British Museum, has been badly damaged by insect pests, and most of its abdomen is eaten away, including the genitalia. This is most unfortunate. A comparison between Hawaiian specimens and Ceylon examples of typical *taprobanes* has revealed some differences in the aedeagus, the form of the processes of the juxta and the valves, and instead of following those who have sunk *brachymorpha* as a synonym, I suggest raising Meyrick's *brachymorpha* to subspecific status. Future studies of more adequate material, including



Figure 345—Female genitalia of Pterophoridae. Above, left: *Megalorhipida defectalis* (Walker); Ceylon. Right: *Lioptilodes parvus* (Walsingham), type; California. Below: *Anstenoptilia marmorodactyla* (Dyar); Hawaiian example.

larvae and pupae, may reveal that it is a species. The California species illustrated under the name *taprobanes* by Lange (1950:600) is quite distinct from either the Ceylon or Hawaiian forms.

Family ALUCITIDAE

Alucitae Linnaeus, 1758:496, 542, in part. Scopoli, 1763:256, in part.

Pterophorii Latreille, 1802:418; 1803:325; 1805:255; all in part.

Pterophorites Latreille, 1809:192, 233; 1810:442; all in part.

Alucitides Leach, 1815:135, in part.

Alucitidae Curtis, 1821:161; 1838:695; all in part. Stephens, 1835:369, in part.

Alucitina Zeller, 1841:866.

Orneodidae Meyrick, 1895:441. Hampson, 1918:386.

T. B. Fletcher, 1910. Meyrick, 1910, 1913.

See Franclemont, 1952:310–311, for a discussion of the family name.

The Many-plumed Moths

The representative of this family in Hawaii has six plumes in both the fore and hind wings, and thus it is easily distinguishable from all other moths in Hawaii. The maxillary palpi, ocelli and chaetosemae are absent, as they are in the Pterophoridae.

Genus **ORNEODES** Latreille

Orneodes Latreille, 1796:148; 1802:418; type: *hexadactyla* Linnaeus, cited by Latreille, 1802:418 and 1810:442.

This is presumably a large genus with representatives supposedly in many parts of the world. The genus is in need of revision; it is probably composite, and little can now be said about it. It is possible that our species does not belong to it, but I have not investigated the problem.

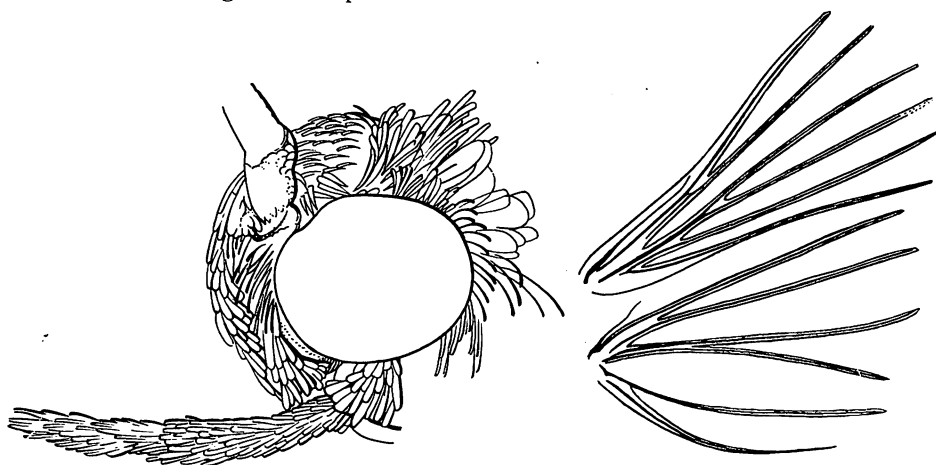


Figure 346—Head and wing venation of *Orneodes objurgatella* Walsingham.

Orneodes objurgatella Walsingham (figs. 346, 347).

Orneodes objurgatella Walsingham, 1907:477, pl. 10, fig. 11. Swezey 1954:171.

Orneodes angustestriata Walsingham, 1907:477, pl. 10, fig. 10. **New synonym.**

Kauai, Oahu, Maui, Hawaii.

Immigrant?

Hostplant: *Plectronia odorata*.

Parasites: *Euderus metallicus* (Ashmead) *Eupelmus* near *aporostichus* Perkins, *Pristomerus hawaiiensis* Perkins.

This species appears to be found wherever its hostplant grows. Heavy infestations have been reported from fruits, flower buds and seeds of *Plectronia*.

Walsingham's *angustestriata*, described from one example, is only a synonym. The illustrations in *Fauna Hawaiiensis* are misleading and indicate differences which are not evident on the types. I have chosen to use *objurgatella* for this species because it has been the name commonly used in our literature, and because the unique type of *angustestriata* has no abdomen and no antennae.

I believe that this species is not a member of the native fauna and that it will some day be reported from its true home outside of Hawaii.

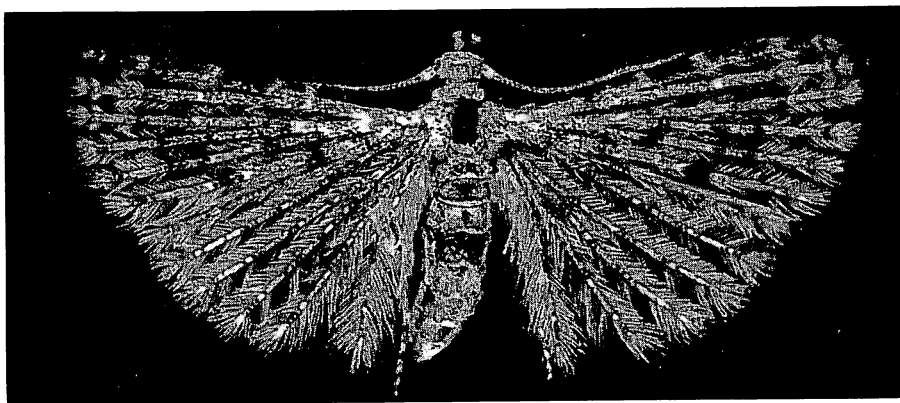


Figure 347—*Orneodes objurgatella* Walsingham; Palolo, Oahu; reared from *Plectronia* fruit; expanse, about 10 mm.

NOTE: The correct number of cuts should be 350 (three are numbered A, B and C), and they include about 980 separate drawings and photographs.

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(This list applies to the entire Order, not to the Pyraloidea only. It is not a complete bibliography. It is, as the title states, a list of the literature consulted during my writing thus far. This list will be enlarged as further work progresses.)

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